THE

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'Knowledge is proud that he has learned so much,
Wisdom is humble that he knows no more.'—COWPER.

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Shakspere's 'Macbeth.'

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THE Syllabus issued by the Education Department, which enumerates the subjects required in the Government Examination for Certificates to be held next December, includes, under the head of English Grammar, Shakspere's play of 'Macbeth.' This applies both to Male and Female Candidates. The latter, according to the Syllabus, are 'to answer questions on the language, style, subject-matter, history, and authorship,' and to paraphrase a passage from the play. It is, therefore, proposed to furnish in the pages of THE PRACTICAL TEACHER a series of articles on the subject, which, it is hoped, will fully meet the necessities of those who are preparing for the Christmas examination, and which at the same time may be of service to teachers and other students of English literature.

We intend to give the text of 'Macbeth,' with comments on such passages as require explanation, always bearing in view the requirements of those for whom the articles are specially designed. But before commencing this, the main part of our work, it will be necessary to make a few preliminary remarks on certain matters involved in the study of Shakspere. Among these might be enumerated many matters common to the study of literature in general, others referring specially to poetry and the drama, and others again more particularly bearing on Shakspere's plays. Out of a great variety of topics we will, however, confine our attention to such points as are indicated in the Syllabus. And in doing this, only a brief sketch of each point thus selected will be given at this stage: a fuller treatment of some or all of them will be more convenient further on; and, meanwhile, the mention of a few standard and easily accessible works will guide those who may desire to pursue the subject more fundamentally and extensively than is requisite in the study of a single play, and that merely for the certificate examination.

I.—With regard to the *Language* of Shakspere, it is always to be borne in mind that it represents English as spoken about three centuries ago, which, although essentially identical with that of our own time, exhibits innumerable shades of difference in the form and uses of words, and especially in their syntactical connections. The differences would be more manifest to us if it were not that we are accustomed to the same form of speech in the Authorised Translation of the Sacred Scriptures, and in the Book of Common Prayer. Shakspere's period of literary activity extended over about a quarter of a century, from about 1588 to about 1612, or in round numbers from 1590 to 1610 (he died in 1616). The Authorised Version of the Bible was published in 1611. As the Prayer Book was first issued in the reign of Edward VI., it represents English of a slightly earlier time, but the term *Tudor English* embraces the peculiarities of the language as appearing in these three and other contemporary works. Moreover, as the Bible of 1611 was mainly a revision of older translations, its style, like that of the Prayer Book, is somewhat more antiquated than Shakspere. Still, the differences are unimportant, and it is thus a remarkable fact that we have in common use these venerable books, constantly keeping in our ears this older stage of the language, and thus serving to facilitate our comprehension of Shakspere's writing, as far as mere forms of speech are concerned.

Of course the peculiarities and distinctions existing in Tudor-English are far less striking than those by which the older stages of the language are marked. In reading Chaucer, a glossary is absolutely necessary for a beginner, and he has many old grammatical forms. Layamon, writing in the time of Henry II., in what is called Early English or Semi-Saxon, is unintelligible without special study, both of the words and inflections which he uses, the former being almost entirely of native origin, and the latter requiring a distinct grammar; while the same remarks apply in a still higher degree to the earliest English or Anglo-Saxon. Compared with these, the differences between our present form of speech and that of our forefathers in the sixteenth century are, for the most part, of a more delicate character. Some, however, are more strongly marked, and all need careful observation and study, the more careful indeed, as they are more fine and subtle. The chief matters to be considered as to the language of the play may be classed under the following heads:—

(1.) First, may be noted obsolete words, that is, such as are wholly unused at the present day. Examples from Macbeth are—*aroint; ronyon; shough; seel, scotch, skarf* (*verbs*); *halter, slab* (*adj.*); *affeered, sag, foisons*. Words like *tarry, marvel, list* (to please), *travail, abide, lack*, would long since have disappeared from the language but for their use in the Bible, and are thus to be considered antiquated, if not obsolete; and the same may be said of those of which the roots still exist, although the words themselves are unused in ordinary English, *e.g., handmaid, husbandman, firmament, froward, stronghold*.

(2.) Obsolete *forms* of words are very common, differing from their modern cognates merely in prefixes and affixes, or other minor incidents. Thus we find *unpossible, infortunate, ugsome, equalness, angerly, ravined* (for *ravenous*, Macbeth, iv. 1), *treasonous, measureless, limbeck* (i. 7). Some of these require special observation, since, from the freedom which characterises Tudor-English, they are occasionally incorrectly formed and used. Thus, words in *-ive* as *unexpressive* (for *inexpressible*) are used with a passive signification. And many obsolete formations exist to which there is now nothing directly answering, *e.g., beweep, fords, twiggen, fielded, pauser* (Macbeth, iii. 3); *memorize* (ii. 1).

(3.) Obsolete and antiquated *significations* of words; that is, the words still exist, unchanged in form, but with new meanings. This is an extensive and interesting branch of the subject, and admits of more systematic and thorough treatment than can be given to it here. The study of derivation is of importance in this connection, as the original, or older, will generally illustrate their various later meanings of words. It may be stated (1) that every root has a material, physical signification, and from this new, non-material, figurative meanings spring. But (2) the original meaning does not always remain; it may be modified by some added subordinate idea, which eventually becomes the prominent one, and displaces the first. Thus *pagan* entirely loses its original sense of a *villager*, through the fact that the country people were converted to Christianity later than the townspeople, and comes to mean a *heathen*, which latter word is similarly connected with *heath*. (3.) Other changes of signification are classified as from indifferent to good or bad, from good to bad, or from bad to good; from a stronger to a weaker, and from a wider to a narrower meaning, or *vice versa*, with some less important, of which may be mentioned, (4) the passing of a word from a higher to a lower style of speech, becoming puerile (as *naughty*) or mean and vulgar. And allied to the last are (5) words found only as provincialisms at present, but many of which appear in the older authors. Several of Shakspere's words are thus illustrated.

Works on the history of words may be consulted on the subject of the three last paragraphs: those by Archbishop Trench are specially instructive. The Globe and some other editions of Shakspere are followed by glossaries; the fullest is Dyce's, which forms the last volume of his edition of the poet.

(4.) Obsolete grammatical forms, and the use of forms which are still extant, but in modes not antiquated. The former are few, the latter very numerous. *Hosen* is an obsolete plural; *help, holp, holpen*, is an instance of a verb formerly conjugated Strong, but now Weak. *Withal, whiles, sith* and *sithence, an* (for *if*), *whenas*, are old forms of particles. *His* and *whose* were possessives of the neuters *is* and *what* as well as of *he* and who; *which* was of three genders; and *whether* was used as interrogative of two objects; *either* was used as the present *both*. The original singular second personal pronoun, though still used in the language of devotion, and in some provincial districts, is otherwise practically obsolete, though put as the only singular form in all modern grammars; while in Shakspere's time, and for half a century subsequently, the use of the plural *you*, &c., in speaking respectfully to superiors, and of the singular *thou*, &c., in familiar, affectionate, and devotional language only, led the way to the present usage. *Ye* was originally the only nominative form, and *you* its objective, but in Tudor-English they became confounded; *ye* frequently appears as objective, and *you* as nominative, till finally *you* has become the only ordinary form for both cases.

One great peculiarity of the language at this period, its most characteristic feature indeed, is the existence of more than one synonymous grammatical form; the older form existing side by side with another more recent, which supplants the earlier. Sometimes there will be several such forms; thus, in the neuter of the third personal pronoun mentioned above, of which *his* was the original possessive case, Shakspere and his contemporaries have, besides *his*, the forms *thereof, of it, it*, and finally *its*, the latter being an entirely new growth and at length the only form used. It was possible at that time to say, 'the tree and *his* fruit,' or the fruit *thereof*, or the fruit *of it*, or *it* fruit, or *its* fruit. Similarly, with regard to the possessive of the interrogative and relative pronoun neuter (originally *whose*), *whereof*, and *of which*, were also in use; but the latter phrase is now the common expression for the possessive of *which* and *what*, though *whose* is still used in poetry and elevated prose.

It is highly instructive to trace the causes which led to the adoption of these various forms, the mode of formation, and the reasons for the prevalence of some particular one among them. Thus with regard to *its*, the old English genitives of the third personal pronoun were identical.

	Mas.	Neut.
Nom.	he	hit.
Gen.	his	

While things without life were in the older tongue (as in Latin and German) as often of the masculine or feminine gender as of the neuter, this was not felt to be inconvenient; but when gender became conformable to nature, as in modern English, an incongruity was perceived in using *his* of an inanimate object. Hence arose the new tentative expressions as substitutes; the compound *thereof*, formed like many others at that time from an adverb and preposition; the phrase *of it* (or of *that*), the simple nominative (or objective) *it*, without any sign of relation, and at length, *its* (formed like the possessive of nouns), which though a philological barbarism, commended itself by its convenience, and so swallowed up the rest.

Here may be mentioned the extensive use of the subjunctive mood: the expletive, non-emphatic *do* and *did* as present and past auxiliaries, with the opposite

usage in the formation of questions without *do* and *did* (They did eat; Lovest thou me?), with many others. Those already referred to are among the more simple and obvious facts bearing on this part of the subject, and may be met with on almost any page of an Elizabethan writer. Others exist in abundance, and may be studied in works specially devoted to the subject, or they may be treated as they occur in the course of reading.

5. Obsolete and antiquated syntactical forms. These will be merely alluded to; and, indeed, as far as the syntax of inflections is concerned there is not much to treat of, but if we include the use of the various parts of speech and the sub-classes, the idioms of the whole language of that time as existing in its literature are brought before us, and a most fruitful form of study is presented, especially when compared with present English. Some points of particular interest are the deviations from the first concord, as seen in the frequent use of a singular verb with a plural subject; the peculiar constructions of the infinitive and the so-called gerund, among which may be enumerated those which have now become vulgarisms (as, I go a-fishing; What went ye out for to see?) the double comparatives and superlatives, and double negatives, and the various antiquated uses of moods and tenses of verbs, and of pronouns and particles. A systematic treatment of such topics as are referred to in this and the preceding paragraph will be found in Dr. Abbott's excellent 'Shakespearian Grammar,' a work which every one who studies the works of our poet ought constantly to refer to.

II.—Under the head of language and *style* may be classed matters of poetic diction and versification, together with such rhetorical usages as are characteristic of the Elizabethan times, and more especially all that is distinctive of Shakspere as a writer, leaving out of view as far as possible what he writes about—his subject-matter.

Much has been written of late upon the subject of Shakspere's metre, and the variations to be found in it at different parts of his poetical career, and elaborate arguments have been founded upon them with reference to the dates of his plays, particularly those about which there is any uncertainty. His metre, the ordinary English Iambic Pentameter—consisting, that is, of five feet of two syllables each, with the accent on every second foot—is subject to various modifications. The accent is frequently reversed; an additional short syllable is sometimes found at the end, and more rarely within the line, and occasionally he has an Alexandrine of six Iambic feet. The lines are usually unrhymed, but at the end of a scene and elsewhere rhymes are met with. Other irregularities, acknowledged by the older commentators, are by recent writers referred to the contraction of two syllables into one, or the stretching out of one syllable into the place of two, often in a somewhat Procrustean manner. The recent school also direct attention to the prevalence of rhyming lines and 'end pauses' or 'stopped lines' in his earlier plays; while the absence of rhyme, and the increasing freedom of metrical style as seen in *light* and *weak endings*, mark his middle and later works. *Light endings* consist of such words as the auxiliary verbs and personal pronouns, which have only a slight tone; *weak endings* are such as the shortest conjunctions and prepositions. Feminine endings—that is, feet with additional short syllables at the end of lines—are also common in the poet's later style.

As to rhetorical forms, the Elizabethan style was full of them to exuberance. The critics of the age of Dryden, Pope, and Johnson, regarded this peculiarity of the older school of poets as contrary to good taste, and their opinion may be received with regard to the more extravagant figures in which their predecessors indulge. But the more catholic criticism of our own times, while not indifferent to æsthetic laws, rather admires the rich and glowing fancy of the older school than the cold precision of the so-called Augustan age.

There was, it is true, an extravagant artificiality which prevailed for a time among the Elizabethan writers and to which the name of *Euphuism* is applied. Shakspere seems to have fallen into this style in some of his works, but he more often satirises it. And the leading characteristic of the period is certainly rather the excess of naturalness than excess of art. Figures of speech when far-fetched or worked out beyond the ordinary bounds of what is generally considered good taste, are called *conceits*. And with these may be ranked the frequent confusion of more than one figure in the same passage, a thing hateful to writers on rhetoric, but which when found in Shakspere is merely the unrestrained overflow of his poetic genius. But here, again, there is variety in his style at various parts of his life, and it is chiefly in the middle period, when his greater works were written, that his thoughts appear too big for words and seek to express themselves in language which, sometimes, and by some classes of mind, may be considered as extravagant.

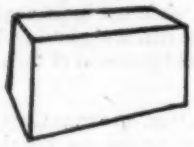
III.—The language and style lead to the consideration of the *matter* of the play. This includes the plot, the characters, and the whole treatment of the subject by the dramatist. As to the incidents on which Shakspere's plays are founded, they were seldom, if ever, invented by himself, but were derived from history, from romances and poems, and sometimes they were modifications of previously existing dramas on the same subject, the latter being chiefly the case in his very early works.

It is chiefly in his artistic handling of the theme, and especially in his development and representation of human character in its multiform manifestations that Shakspere is so great. His men and women are living beings, of like passions with ourselves, each having his or her own phase of character, and acting in accordance with their peculiarities of nature and disposition under certain given relations. He appears, moreover, as the German critics, especially Gervinus, show, to have generally worked out a predominant idea in most of his plays. Thus as has been often stated, Hamlet represents a man in whom the intellect and emotions are stronger than the will, set to perform a great work—a work indeed, too great for one of his type to accomplish successfully. And in Macbeth, we have one who appears at first as a brave and loyal subject falling under the influence of temptation, and gradually passing from good to bad and from bad to worse, till he becomes almost a demon.

(To be continued.)

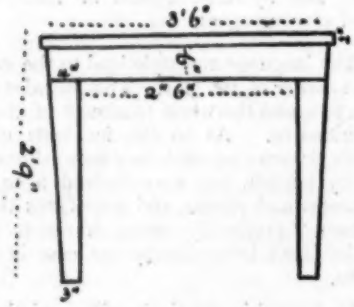
Notes on Seven Recent Complete Drawing Examinations.

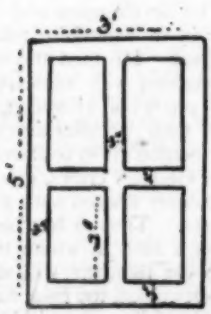
COLLECTED BY A LONDON SCHOOL BOARD MASTER.



Examination F.—For Model Drawing the rectangular prism was placed on a blackboard upon the floor, but in this instance the blackboard was not to be drawn.

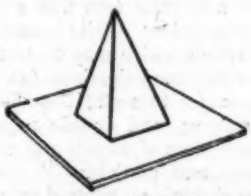
The card given to each child using plain paper for Scale drawing was similar to that used in *Examination E.*



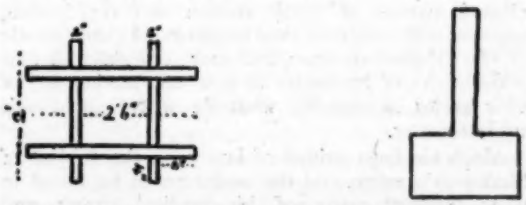


The card given to those who used squared paper contained two copies; for the first each square represented one inch, and for the second each square represented 2 inches.

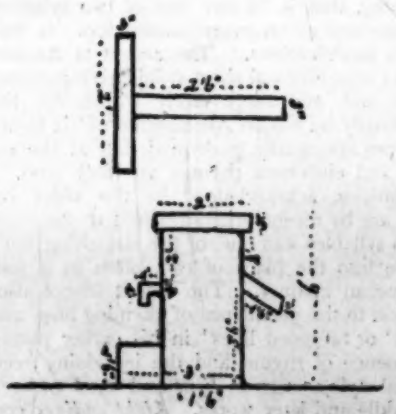
A sheet of paper was placed on a blackboard, to the left of the class, with the Freehand copy upon it. The children were told to draw a figure as large as their paper would permit.



Examination G.—The Model in this Examination was a square pyramid standing upon a blackboard. The blackboard was placed on the floor to the right of the class, and consequently its sides were not parallel to the eye of those who drew it.



The first figure on the card for those who used plain paper was to be drawn to a scale of one inch to the foot, and the second to be copied three times the given size.

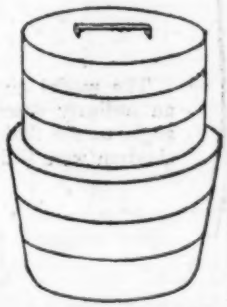


The card given to those who used squared paper contained two copies to be drawn, allowing each square to represent 1 inch and 2 inches respectively.

The Freehand copy was similar to that given in *Examination D.*

STANDARD V.

The work in this Standard consists of Freehand, Geometry, and Model Drawing; consequently the class is divided into three sections for examination purposes. The inspector usually selects an object in the room, such as a cupboard, a desk, or a chair, for the Model drawing, so that the teacher should carefully prepare the children in this style of work.



Examination A.—The freehand copy was on a large sheet of paper and was fastened to the door of a cupboard in front of the class.

The Geometry Card given to each child in the section contained three questions.

(1) Copy the two given points A and B, join them by a straight line, and construct an equilateral triangle upon that line.

(2) Construct a right angle, and divide it into four equal parts.

(3) Construct two circles touching each other, the one with a radius of an inch, and the other with a radius of half an inch.

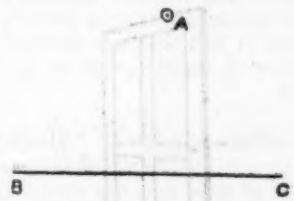
The third section, which had Model Drawing, consisted of the two front rows of the class. They were set to draw the cupboard which was in the right hand corner of the room. The door of the cupboard was open a short distance.

Examination B.—The Freehand section had a copy placed in front of them, of a leaf and stem, of which they were told to make a copy.

The Geometrical Card contained three questions which were:—

(1) Construct a triangle having a base of 2 inches and angles of 60°, 45°, and 75° respectively.

(2) Construct a square with sides of 2 inches each.



(3) Copy the given point A and the given line B C. From A draw a line perpendicular to the line B C.

For Model the boys were given a hexagonal prism standing upon the top of a teacher's desk, the top of the desk to be drawn.

Examination C.—The Freehand copy consisted of a bi-symmetrical figure, which was placed before the class.

The Geometry card, given to alternate scholars, contained the three following questions:—

1. Describe an equilateral triangle with sides of two inches each.

2. Draw a line like the given line, and make another parallel to it, at a distance of one inch from it.

3. Describe a circle similar to the given circle, and with the same radius, describe a second circle touching it at the point A.

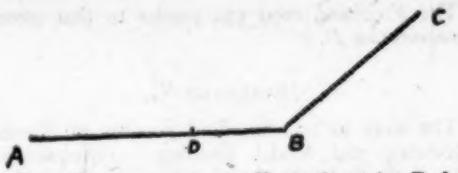
Each child in the third section was told to make a drawing of the class-room door which was open.

Examination D.—The Freehand copy was placed before the class and was drawn by alternate boys. It was a shell.

The Geometry card had three questions, which were:—

1. Copy the given line and draw another of the same length parallel to it at a distance of one inch.

2. Construct an equilateral triangle with sides of two feet each. (Scale 1½ in. to the foot.)



3. Copy the given figure. From the point D draw a line parallel and equal to BC.

The model given was to draw an ordinary easel placed at an angle to the desks in which the children were sitting.

Examination E.—The Freehand copy was like that given in *Examination B.* The three questions on the Geometry card were:—

1. Construct a triangle having two sides of 1½" and 2½" respectively.

2. Copy the given angle and construct another twice the size of the given one.

3. Copy the line AB and construct a line at right angles to it from the point B.

There was no model.

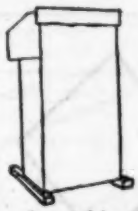
Examination F.—The Freehand copy was placed before the class as in each of the other examinations.

The Geometry card contained the following three questions:—

1. Copy the given line and divide it into five equal parts.

2. Construct an isosceles triangle having sides of 2 inches and each of the equal angles of 45°.

3. Describe a circle with radius of $\frac{3}{4}$" and another with radius of 1" touching it.



The section of the class taking Model Drawing had to draw a Pupil Teachers' desk.

Examination G.—Each child in the Freehand section was given a copy upon a card. There were several figures similar to those of which sketches have been given in other Examinations. The children were told to enlarge their drawings so as to fill each paper.

The second section taking Geometry were also given cards. These cards consisted of different sets of questions. There were the same exercises as those given in *Examinations A, D,* and *E,* as well as the following:—

1. Copy the given line and drop a perpendicular upon it from the given point A.

2. Construct an isosceles triangle upon a base of 2 inches with a vertical angle of 45°.

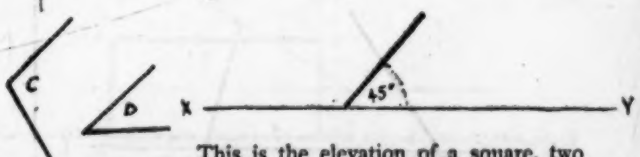
3. Copy the given lines, and draw another parallel to them and midway between them.

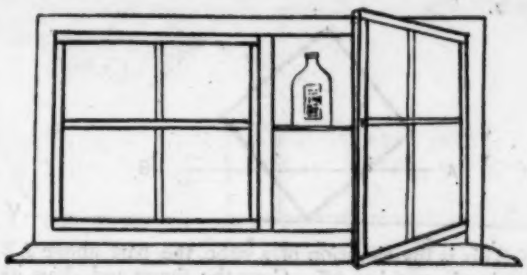
Another Card:—

1. Draw a line three inches in length and divide it into seven equal parts.

2. Construct an angle of 30° and bisect it.

3. Copy the given line AB, and make an angle at A equal to the angle C, and an angle at B equal to the angle D.





There was a cupboard in the room (consisting really of two cupboards, one upon the other), and the Model section had to draw the bottom part of it, one door being open.

STANDARD VI.

The work in this Standard also consists of three parts, but up to the present the number examined has been comparatively small, so that in some instances the whole three sections have not been given.

Examination A.—In this examination the children were not examined in Model and Geometrical Drawing. The Freehand copy was pinned in front of the class. It was exactly like the first figure in the official syllabus for Standard VI.

Examination B.—In this examination all the children were presented for *certificates of merit,* so that *each* child was examined in Freehand, Geometrical, and Model Drawing.

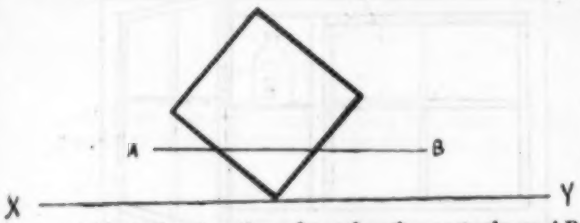
The Freehand copy was placed before the class, but was not distinctly seen by all the scholars.

The Geometry card contained two questions only, which are given, viz.,

1.

This is the elevation of a square, two sides being perpendicular to the vertical plane, and the other two at an angle of 45° to the horizontal plane. Copy this and draw the plan.

2.



This is the elevation of a cube, the part above AB having been taken off. Copy the figure and draw its plan.

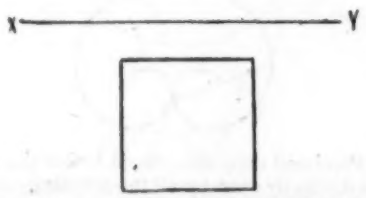
The Model consisted of the group given in the syllabus, which contains a book, teacup, saucer, and spoon.

(The time allowed in each section was 40 minutes.)

Examination C.—The class was divided into two sections only, no model being set. The Freehand copy was placed in front of the class. It was a floral design.

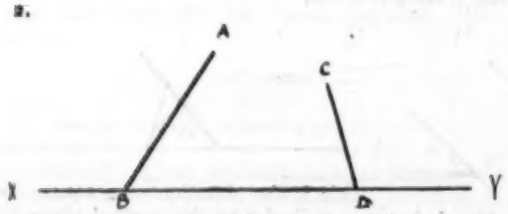
The Geometry card contained two problems only. They were :—

1.



The given figure is the plan of a right prism. Its altitude is to be 2". Copy it and draw its elevation.

2.

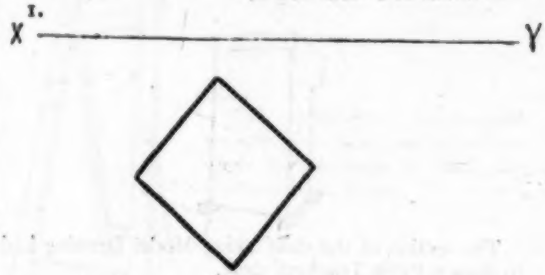


AB and CD are the elevations of two right lines. Copy them and draw their plans.

Examination D.—The Freehand copy was placed before the class, and the children who drew it were told to be careful to have a *large* copy on their papers. The figure was the same as that given in *Examination C.*

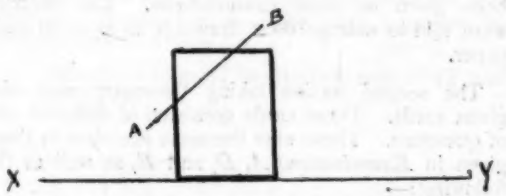
The scholars who took Geometry were placed in different desks and in positions that insured that each one did his own work, and could not copy from his neighbour. The card contained these two problems :—

1.



This is the plan of a cube; copy it and draw its elevation.

2.



This is the elevation of a prism, the base of which is a square. It is standing on its base. Copy it, and draw the elevation, showing the section marked by the plane AB.

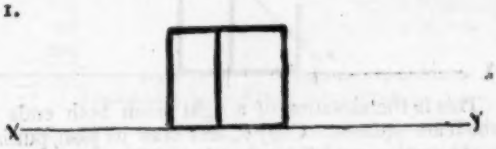
The model was an easel, similar to that given in *Examination D* for Standard V.

Examination E.—The children were examined for *certificates* in this instance, so that each one had to do Freehand, Geometry, and Model.

The Freehand copy was placed in front of the class. It was a bi-symmetrical figure.

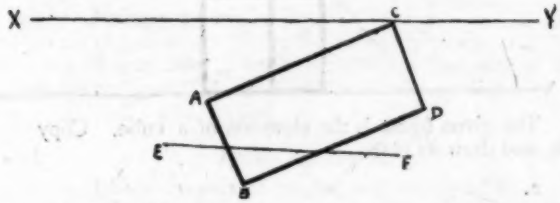
The cards given in Geometry were of three kinds. There was one like that given in *Examination D*, and the two which follow:—

1.

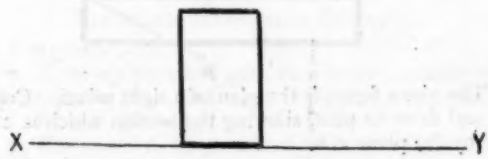


This is the elevation of a cube. Copy it, and draw its plan.

2.



This is the plan of a right prism. Its bases AB and CD are squares. Copy it, and draw its elevation, showing the section made by the plane EF.



1. The given figure is the elevation of a square. Copy it, and draw its plan.

2. The given figure is the plan of a right prism. Its altitude is to be 2". Copy it, and draw its elevation.

The model set consisted of a blackboard upon which a basin and pail were placed.

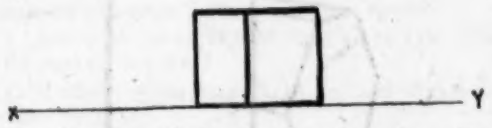
Examination F.—As no certificates were tried for in this examination, the class was divided into three sections.

The Freehand section had a copy similar to that given in *Examinations C and D*.

There were three cards given in Geometry. They were as follow:—

(*Card I.*)

1.



The given figure is the elevation of a cube. Copy it and draw its plan.

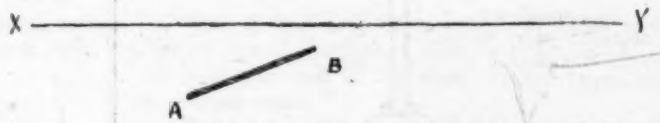
2. Give the plan and elevation of a cube of $1\frac{1}{2}$" sides. The solid rests upon the H. P. on one of its faces, and one diagonal of this face is parallel to the V. P.

(*Card II.*)

1.

The given figure is the plan of a right prism standing on its base on the H. P. The altitude is to be 2". Copy it and draw its elevation.

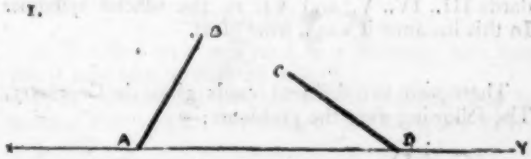
2.



The right line AB is the plan of a line $2\frac{1}{2}$" long. The end A is standing on the H. P. The end B is above. Copy it, and draw its elevation.

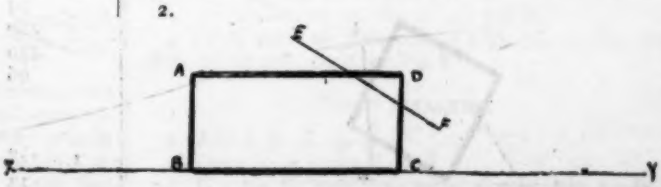
(*Card III.*)

1.



AB and CD are the elevations of two lines which are parallel to the V. P. Copy them and draw their plans.

2.



ABCD is the elevation of a right prism, the two ends of which are squares. Copy the figure and draw its plan, showing the section cut off by the plane EF.

The section taking model had a group similar to that given in the syllabus, in which the hexagonal prism is given, but in this instance an 'ink jar' was used instead of the vase.

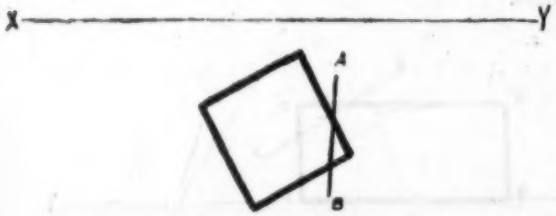
Examination G.—The children were examined for certificates, consequently each child did the work set in Freehand, Model, and Geometry.

The Freehand copy was one of the 'common objects' of which there are specimens given in Standards III., IV., V., and VI. in the official syllabus. In this instance it was a wine glass.

There were two different cards given in Geometry. The following were the problems:—

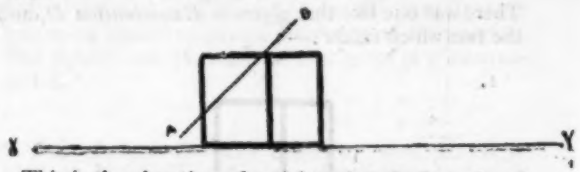
(*Card I.*)

1.



The given figure is the plan of a cube. Copy it, and draw its elevation, showing the section cut off by the plane AB.

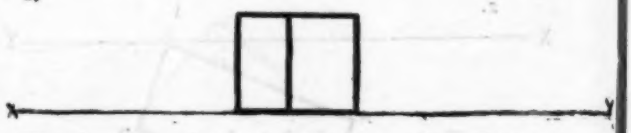
2.



This is the elevation of a right prism both ends of which are squares. Copy it, and draw its plan, putting in the section cut off by the plane AB.

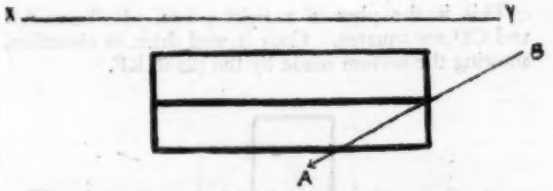
(*Card II.*)

1.



The given figure is the elevation of a cube. Copy it, and draw its plan.

2.



The given figure is the plan of a right prism. Copy it, and draw its plan, showing the section which is cut off by the plane AB.

The model consisted of a group similar to that in the last named examination. A vase and a book were placed on a blackboard, resting upon a chair. The blackboard was not to be drawn.

Quarterly Arithmetical Tests.

STANDARD I.—FIRST QUARTER.

1. 5, 74, 280, 439, 66

2. 359 − 26

3. 584 − 530

4. 11 × 2; 7 × 4; 3 × 3.

SECOND QUARTER.

1. 738, 14, 500, 6, 392

2. 420 − 206

3. Take 7 from 80

4. 4 × 6; 9 × 3; 5 × 8.

THIRD QUARTER.

1. 65
650
7
98
809

2. 300
11

3. 472
274

4. 6×9;
7×5;
4×12.

STANDARD II.—FIRST QUARTER.

1. 37,459 + 605 + 4,710 + 5,096 + 28 + 16,007.
2. Take 37 from twenty thousand.
3. 4,690 × 49.
4. 18d.; 33d.; 46d.

SECOND QUARTER.

1. Multiply 87,065 by 870.
2. 36,312 ÷ 4. Write the answer in words.
3. A man rides 7 hours per day at the rate of 6 miles an hour. How far will he ride in 19 days?
4. 77d.; 96d.; 109d.

THIRD QUARTER.

1. Divide the sum of 37,209 and 26,295 by 8.
2. 93,758 × 6,053.
3. I had 864 nuts, and I divided one third of them among a dozen boys. How many did each boy receive?
4. 113d.; 125d.; 131d.

STANDARD III.—FIRST QUARTER.

1. 43,290 ÷ 78.
2. If twenty thousand nuts were divided among 150 boys and 160 girls, and each boy got 80, how many did each girl get?
3. How often is 69 contained in ninety-three thousand one hundred and fifty?
4. A greengrocer bought 21 sacks of potatoes, each containing 180 pounds. If he sell 140 pounds daily, how long will it take him to sell all?

SECOND QUARTER.

1. Add together £756 10s. 7¾d., £4,085 12s. 10½d., £19,607 15s. 8¾d., £8,009 18s. 6¼d., and £328 6s. 11½d.
2. Take £7 16s. 11d. from £304 12s. 10¾d.
3. In a mixed school there are 257 girls, and 38 more boys than girls. What is the total number of scholars?
4. There were 576 oranges in a box. A sixth part were not fit for sale. What would be received for the remainder at 9d. per dozen?

THIRD QUARTER.

1. What must you add to nine hundred and five pounds seventeen shillings and six pence three farthings to make one thousand and one pounds one shilling and a penny?
2. If 1,500 apples have to be divided among 76 boys, but 56 are bad and are thrown away, how many will each boy receive?
3. £280 17s. 6½d. + nine thousand and seventeen pounds twelve shillings and eight pence halfpenny + £75 14s. 11¾d. + three hundred and ninety pounds three shillings and three halfpence + £6 19s. 8½d. + two thousand and four pounds sixteen shillings and five pence three farthings.
4. By how much does 768 pounds exceed 768 shillings?

STANDARD IV.—FIRST QUARTER.

1. Multiply 16s. 9¾d. by 706.
2. Seven men had together 25 guineas. Three saved 8s. 3d. each, two saved 6s. 5d. each, and the remainder was spent. How much was spent?
3. A farm of 190 acres is let for £2,379 15s. What is the rent of one acre?
4. Multiply £584 2s. 1½d. by 79, and divide the product by 474.

SECOND QUARTER.

1. How many 2 lb. packets can be made from a quarter of a ton?
2. Reduce three million thirteen thousand and thirty inches to leagues, miles, yards, &c.
3. How many square yards are there in half a square mile?
4. A wished to exchange 30 gallons of rum at £1 5s. per gallon with B for ale at 1s. 6d. per gallon. How many gallons of ale should he receive?

THIRD QUARTER.

1. How many seconds are there in the months of January and February, 1889?
2. Find the value of half an acre of land at 3s. 10d. per square yard.
3. How many half-pint glasses can be filled from 17 hogsheads of beer, each containing 54 gallons?
4. A ton of sugar was bought for twenty guineas, and sold at 2½d. per lb. How much was gained?

STANDARD V.—FIRST QUARTER.

1. What is the value of seventeen thousand and nineteen caps at elevenpence three farthings each?
2. Find the cost of 15 stone 13 lbs. 10 oz. at 18s. 8d. per stone.
3. In a year 39,807 ounces of gold were exported from Australia. Find the value at £3 17s. 10½d. per oz.
4. What would be the cost for 13 miles 6 fur. 19 po. at £5 13s. 4d. per mile?

SECOND QUARTER.

1. If a boy walk 330 yards in 5 minutes, how long will it take him to walk 2¼ miles?
2. A gentleman's income is 700 guineas, and he saves £178 7s. 6d. How much does he spend daily?
3. Bill:—
19½ lbs. sugar at 3½ per lb.;
25 lbs. candles at 8½d. per lb.;
13½ lbs. plums at 5½d. per lb.;
3½ lbs. tea at 2½d. per oz.;
11 lbs. 10 oz. rice at 4d. per lb.
4. If 17 stone of flour cost £1 9s. 9d., what is the value of 13 cwt. 3 qrs. 25 lbs.?

THIRD QUARTER.

1. Add $\frac{3}{5}$, $\frac{4}{9}$, $\frac{7}{10}$, $\frac{1}{2}$.
2. From $\frac{1}{3} + \frac{1}{4}$ take $\frac{7}{8} - \frac{5}{6}$.
3. If a ton be carried 60 miles for 7s. 6d., how far would it be carried for 13s. 4d.?
4. From an orange I cut away $\frac{2}{5}$, $\frac{1}{6}$, and $\frac{1}{3}$. What fraction of the orange is left?

STANDARD VI.—FIRST QUARTER.

1. What must be added to $\frac{7}{9}$ of $1\frac{3}{14}$ of $6\frac{1}{8}$ to make the result an integer?

2. Find the continued product of 6·078, ·06078, and ·0006078.

3. Simplify:— $\dfrac{4\frac{1}{7} - 2\frac{3}{4} \text{ of } \frac{3}{8}}{\frac{1}{2} + \frac{5}{6} - \frac{4}{5} \text{ of } 1\frac{1}{2}}$.

4. Find the value of $7\cdot\dot{3}\dot{5} - 6\cdot\dot{4}\dot{8}$.

SECOND QUARTER.

1. If the ratio of the diameter of a wheel to the circumference is as 7 : 22, what is the diameter when the circumference is 13 ft. 9 in.?

2. Reduce $\frac{5}{6}$ of $\frac{3}{5}$ of a crown to the decimal of half a guinea.

3. If £119 7s. be divided among 3 men and 7 women, giving each woman four times as much as a man, what is a man's share?

4. If $3\cdot\dot{6}$ lbs. cost $11\cdot9\dot{1}$6s., what will 2·5 stone cost?

THIRD QUARTER.

1. A can do a piece of work in 15 days, and A and B can do it in 9 days. How long will it take B by himself?

2. Find the amount of 15 guineas in 15 years at $3\frac{1}{2}$ per cent., simple interest.

3. A man owns ·59 of a ship, and his brother owns the rest. The difference in the value of their shares is £589 10s. Find the value of the ship.

4. In what time will £650 amount to £728 at 4 per cent.?

STANDARD VII.—FIRST QUARTER.

1. If $8\frac{1}{2}$ cwt. be carried 35 miles for 5s. 8d., how far should $3\frac{1}{2}$ tons be carried for £4 12s.?

2. What decimal must be added to $\frac{2}{3\cdot6} + \frac{1}{1\frac{5}{6}} + \frac{1}{1\frac{1}{2}}$ to make the result 3?

3. The carpet for a room 24 feet wide at 3s. 6d. per yard cost 6 guineas. What will it cost for a room 30 feet wide and the same length as the other room at 4s. 9d. per yard?

4. At what rate per cent. will £580 gain £156 12s. in $4\frac{1}{2}$ years?

SECOND QUARTER.

1. A coal dealer sells $17\frac{1}{2}$ tons on Monday, 26 tons 11 cwt. on Tuesday, 18 tons 7 cwt. on Wednesday, 19·45 tons on Thursday, 32 tons on Friday, and 54 tons 19 cwt. on Saturday. What is his average daily sale?

2. A digs $\frac{3}{7}$ of a field in 10 days, and with B's help finishes it in 5 days. How long would B take to dig the whole field?

3. I bought 7 sheep at 59s. each, 4 at 63s., 3 at 50s., and had one given. What was the average cost of each sheep?

4. If $\frac{1}{8}$ of a sheep be worth $£\frac{3}{4}$, and $\frac{5}{9}$ of a sheep be worth $\frac{1}{15}$ of a horse, find the value of 30 horses.

THIRD QUARTER.

1. A tradesman takes off 5 per cent. for ready money, and a purchaser pays £72 4s. ready money. What was the amount of the bill?

2. A boy was apprenticed when he was 14 years old, and a sum of money was placed in a savings bank to set him up in business when he reached the age of 21. If the interest allowed was $2\frac{3}{4}$ per cent., and the sum withdrawn was £1,788 15s., what was the amount deposited?

3. If a shopkeeper gain 4s. 6d. on an article which he sells for a guinea, what is his gain per cent.?

4. A bought a horse for £30, and sold it to B at a profit of $12\frac{1}{2}$ per cent. B sold it to C for £30. What was his percentage of loss?

ANSWERS.

STANDARD I.

	FIRST.	SECOND.	THIRD.
1.	864.	1,650.	1,629.
2.	333.	214.	289.
3.	54.	73.	198.
4.	22 ; 28 ; 9.	24; 27; 40.	54; 35; 48.

STANDARD II.

	FIRST.	SECOND.
1.	63,905.	75,746,550.
2.	19,963.	9,078.
3.	229,810.	798 miles.
4.	1s. 6d. ; 2s. 9d. ; 3s. 10d.	6s. 5d. ; 8s. ; 9s. 1d.

THIRD.

1. 7,938.
2. 567,517,174.
3. 24 nuts.
4. 9s. 5d. ; 10s. 5d. ; 10s. 11d.

STANDARD III.

	FIRST.	SECOND.	THIRD.
1.	555.	£32,788 4s. 8$\frac{3}{4}$d.	£95 3s. 6$\frac{1}{4}$d.
2.	50 nuts.	£296 15s. 11$\frac{1}{2}$d.	19 apples.
3.	1,350 times.	552 scholars.	£11,776 4s. 6d.
4.	27 days.	£1 10s.	£729 12s.

STANDARD IV.

	FIRST.	SECOND.
1.	£593 9s. 7$\frac{1}{2}$d.	280 packets.
2.	£24 7s. 5d.	15 leag. 2 mls. 975 yds. 10 in.
3.	£12 10s. 6d.	1,548,800 sq. yds.
4.	£97 7s. 0$\frac{1}{4}$d.	500 gals.

THIRD.

1. 5,097,600 sec.
2. £463 16s. 8d.
3. 14,688 glasses.
4. £2 6s. 8d.

STANDARD V.—FIRST.

1. £833 4s. 5$\frac{1}{4}$d.
2. £14 18s. 2d.
3. £154,998 10s. 1$\frac{1}{2}$d.
4. £78 5s. 0$\frac{1}{4}$d.

SECOND.

1. 1 hour.
2. £1 10s. 6d.
3. 5s. 8$\frac{1}{2}$d. + 17s. 8$\frac{1}{2}$d. + 6s. 2$\frac{1}{4}$d. + 10s. 10d. + 3s. 10$\frac{1}{2}$d. = £2 4s. 3$\frac{1}{2}$d.
4. £9 15s. 7$\frac{1}{2}$d.

THIRD.

1. $1\frac{1}{13}$.
2. $\frac{1}{13}$.
3. 106$\frac{2}{3}$ miles.
4. $\frac{1}{10}$.

STANDARD VI.

	FIRST.	SECOND.	THIRD.
1.	$\frac{11}{121}$.	4 ft. 4$\frac{1}{2}$ in.	22$\frac{1}{2}$ days.
2.	·000224533986552.	·3472.	£23 12s. 6d.
3.	$2\frac{2}{11}$.	£3 17s.	£3,275.
4.	·370.	£5 13s. 9d.	£3 years.

STANDARD VII.

	FIRST.	SECOND.	THIRD.
1.	69 miles.	28 tons 2$\frac{3}{4}$ cwt.	£76.
2.	·34027.	14 days.	£1,500.
3.	£10 13s. 9d.	£2 14s. 4d.	27$\frac{3}{11}$ per cent.
4.	6 per cent.	£1,350.	11$\frac{1}{9}$ per cent.

Notes of Lessons on the Oceans.

BY JOSEPH H. COWHAM, F.G.S.,
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PART I.

FACTS STATED IN THE ORDER OF TEACHING.

A. Distribution of land and water.

1. If a globe be adjusted so that its highest point is in the centre of St. George's Channels the hemisphere surrounding that point will contain the greatest proportion of land possible. **This forms the Land Hemisphere.**

In this hemisphere the

Land = 44,000,000 sq. miles

Water = 54,500,000 „ „

2. By reversing the globe and thus bringing New Zealand to the highest point, we obtain a view of the hemisphere containing the greatest proportion of water possible. **This is the Water Hemisphere.**

In this hemisphere the

Land = 8,000,000 sq. miles

Water = 90,500,000 „ „

B. The Chief Oceans, their position and size.

1. **The Pacific Ocean** separates North and South America on the east, from Asia and Australasia on the west. It stretches from Behring Straits in the north to the Antarctic Ocean in the south.

The *length* from north to south is **9,000 miles.**

The *breadth* in the south is **12,000 miles.**

The *area* is **67,000,000 square miles.**

2. **The Atlantic Ocean** separates the Old World from the New World, and stretches from the Arctic Ocean in the north to the Antarctic Ocean in the south.

The *length* from north to south is **9,000 miles.**

The *breadth* varies from **5,000 miles** at the Tropic of Cancer to **1,700 miles** between Norway and Greenland.

The *area* is **35,000,000 square miles.**

ILLUSTRATIONS AND OTHER AIDS TO TEACHING.

Fig. 1. The Land Hemisphere.

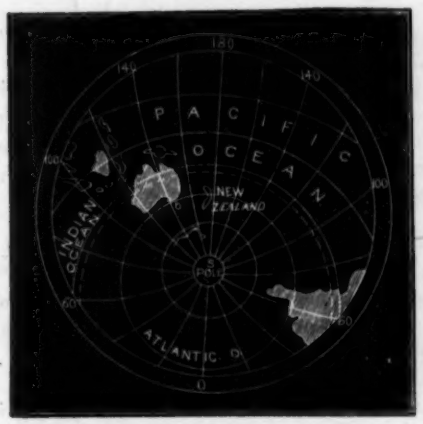

Fig. 2. The Water Hemisphere.

1. Point out the position of each Geographical fact belonging to the Pacific Ocean on a map of the world, or better still on a sketch map prepared to show only the places named.

2. In the same way impress the facts connected with the Atlantic and Indian Oceans respectively.

The figures of length, breadth, and area, may be arranged in teaching so that by bringing out points of contrast and similarity they may be more deeply impressed and readily remembered, as for example :—

1. The length of the Pacific and the Atlantic Oceans is the same, and both are twice as long as the Indian Ocean.

2. The area of the Pacific is almost twice that of the Atlantic, and three times that of the Indian.

Proceed in the same way to impress the facts connected with the Arctic and Antarctic Oceans.

3. **The Indian Ocean** is situated south of Asia. It separates the continent of Africa from the East India Islands and Australasia.

The *length* from north to south is over **4,500 miles.**

The *breadth* along the Tropic of Capricorn is **5,000 miles.**

The *area* is **25,000,000 square miles.**

4. **The Arctic Ocean** round the north pole and the **Antarctic Ocean** round the south pole, are the remaining ocean areas of importance.

The area of the Arctic Ocean is **5,500,000 square miles.**

The area of the Antarctic Ocean is unknown.

C. Depth of the Ocean.

How determined:—

1. Formerly a heavy piece of lead was attached to a rope and thrown overboard. This served its purpose in shallow areas, but in the deepest oceans the depth was often greatly exaggerated, chiefly on account of the under-currents bearing the line away from the vertical position.

Sometimes sailors failed to reach any bottom at all, or if they did, they were unable to tell when, in consequence of the currents and the weight of the rope continuing to run out the line.

2. The improved method of sounding introduced by Lieutenant Brooke possesses the following features:—

(*a*) Wire is used in place of rope in order to lessen the effect of the under-currents.

(*b*) The weight or sinker is made sufficiently heavy to carry the rope down as nearly vertically as possible.

(*c*) This weight becomes detached as soon as the apparatus touches the bottom, leaving only a tube, used for collecting specimens of the ocean floor, to be raised.

In Fig. 5 the number 2 is against a sling which is attached to a notch at 1. This slips off when the tube strikes the bottom, and liberates the sinkers 3, 4, 5, 6. In B, figure 7 shows the sling thrown off.

The following diagram will also assist in realizing the relative sizes of the various oceans.

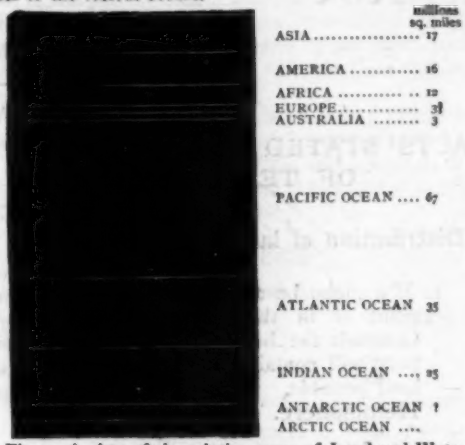

Fig. 3. A view of the relative areas of Land and Water.

Fig. 4. Old mode of sounding, showing how error arises on account of currents.

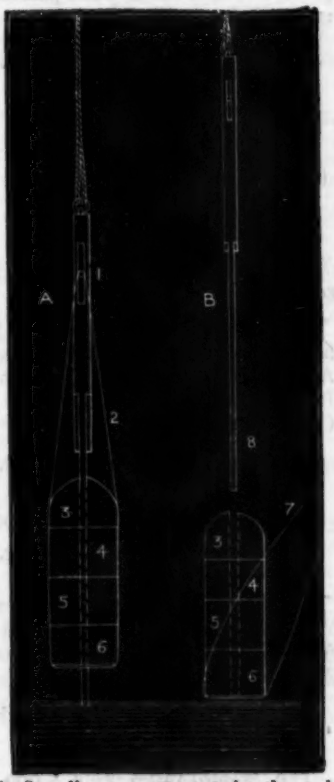

Fig. 5. A. Sounding apparatus entering the mud.
B. Apparatus being drawn up and leaving the sinkers, 3, 4, 5, and 6, behind.
In the tube at 8 the specimens from the bed of the ocean are held.

BLACKBOARD NOTES.

1. England is the centre of the Land Hemisphere.
   This hemisphere contains **44,000,000 square miles of land.**
2. New Zealand is the centre of the Water Hemisphere.
   This hemisphere contains **90,500,000 square miles of water.**
3. The chief oceans are:—
   The Pacific with 67,000,000 square miles.
   The Atlantic with 35,000,000 ,, ,,
   The Indian with 25,000,000 ,, ,,
4. The old method of sounding by rope and lead is replaced for great depths **by Lieutenant Brooke's apparatus.**
5. In this apparatus—
   (*a*) Heavy weights sink the line (wire) and prevent currents carrying it away.
   (*b*) The weights are left upon the sea floor, and the tube is then easily raised.
   (*c*) A hollow tube collects the mud and **conveys it for examination** to the surface.

Tests in Mental Arithmetic.

STANDARD I.

1. From five fives take four fours. 9.
2. If there are 6 rows and 8 boys in a row, how many short of half a hundred are there? 2.
3. How many times can I spend a halfpenny out of 9d.? 18.
4. What would 12 balls cost at 3d. each? 3s.
5. If one boy has saved 3s., and another boy twice as much, how much have they together? 9s.
6. How much more would make a sovereign? 11s.
7. Annie had 6d., and spent 2½d.; how much had she left? 3½d.
8. How many farthings are equal to that? 14.
9. Add 7, 6, 5, 4, and take half. 11.
10. Take 10¾d. from a shilling. 1¼d.
11. I have half-a-crown, and spend half of it; how much have I left? 1s. 3d.
12. How many fivepenny books could be bought with that amount? 3.

STANDARD II.

1. Find the cost of 27 farthing tops. 6¾d.
2. What change would be received out of a shilling? 5¼d.
3. Harry saved 7½d. and Thomas 4½d. William saved three times as much as the two together; how much did he save? 3s.
4. Divide 3s. among four boys; how many pence pence is that for each boy? 9d.
5. Divide 9d. among four boys; how much would each boy receive? 2¼d.
6. How many pence are there in a crown and a shilling? 72d.
7. How many dozen are there in 72? 6.
8. What would 6 oranges cost at 9d. a dozen? 4½d.
9. How many boys could get a farthing each out of that sum? 18.
10. How many halfpenny oranges could you get for 1s. 1½d.? 27.
11. How many more are required to make two score? 13.
12. What would two score oranges cost at 6d. a dozen? 1s. 8d.

STANDARD III.

1. How many must you add to a hundred to make 9 dozen? 8.
2. Take 1s. 8d. from half-a-crown. 10d.
3. Divide 10d. among 8 boys; how much is that for each boy? 1¼d.
4. If a boy earn 9s. a week, and another boy 6s. a week, how much would they both earn in a month? £3.
5. How many pieces of ribbon 2 inches long can be cut from a yard? 18.
6. What would a yard of ribbon cost at a farthing an inch? 9d.
7. From a crown take the sum of 2s. 9d. and 1s. 10d. 5d.
8. How many lbs. of soap at 5d. a lb. can be bought for a florin and a penny? 5 lbs.
9. How many ounces would that be? 80 oz.
10. What is the cost of 3 dozen pears at 1½d. each? 4s. 6d.
11. Divide 4s. 6d. among 4 persons? how much would each receive? 1s. 1½d.
12. How many score are there in 6 dozen and 8? 4.

STANDARD IV.

1. What part of a shilling is 1½d.? $\frac{1}{8}$.
2. From $\frac{3}{4}$ of £1 take $\frac{2}{3}$ of £1. 1s. 8d.
3. How much is $\frac{1}{2}$ of $\frac{1}{2}$ of a guinea? 5s. 3d.
4. What part of a ton is a quarter? $\frac{1}{80}$.
5. How many stone are equal to 3¾ cwt.? 30.
6. Find the cost of $\frac{4}{5}$ cwt. of tea at 4s. a lb. £5 12.
7. What would 6 ounces of tea cost at the same price? 1s. 6d.
8. What part of 132 is a dozen? $\frac{1}{11}$.
9. If a boy save a penny a day, what would he have saved in 1888? £1 10s. 6d.

10. If a boy save 2d. a day during February in 1888 and 1889, how much would he save? 9s. 6d.
11. What part of a mile is a pole? $\frac{1}{320}$.
12. If 9 horses cost £177, what would 3 horses cost? £59.

STANDARD V.

1. How many ounces are there in $\frac{3}{4}$ stone? 168.
2. Find the cost of $2\frac{1}{2}$ stone of flour at $1\frac{1}{2}$d. per lb. 4s. $4\frac{1}{2}$d.
3. If you can get $\frac{1}{4}$ lb. tea for 9d., how many lbs. could you get for half a guinea? $3\frac{1}{2}$ lbs.
4. If three boys earn 17s. 6d., what will four boys earn? £1 3s. 4d.
5. What is the G. C. M. of 10 and 25? 5.
6. What is the L. C. M. of 10 and 25? 50.
7. Add $\frac{1}{20}$ and $\frac{1}{30}$. $\frac{1}{12}$.
8. How many times can you take $\frac{1}{12}$ from $\frac{1}{3}$? 4.
9. What is the difference between $\frac{1}{20}$ and $\frac{1}{30}$? $\frac{1}{60}$.
10. How much is $\frac{1}{3}$ of $\frac{1}{4}$ of $\frac{1}{5}$ of £1? 4d.
11. What fraction of a florin is that amount? $\frac{1}{96}$.
12. Find the interest on £650 for half a year at 6 per cent. £19 10s.

STANDARDS VI. AND VII.

1. If I change 7 to 9 in the fraction $\frac{3}{7}$, what difference is made? $\frac{4}{63}$.
2. Bring ·08 to a vulgar fraction. $\frac{2}{25}$.
3. Multiply 2·02 by 100. 202.
4. Divide 2·02 by 100. ·0202.
5. What fraction of half-a-crown is 2s. 1d.? $\frac{5}{6}$.
6. What is the square of 18? 324.
7. How many times is the average of 4, 5, 6, contained in the average of 9, 10, 11? 2.
8. What fraction of £144 is the interest on £300 for 3 years at 4 per cent.? $\frac{1}{4}$.
9. At what rate per cent. would £79 12s. 6d. double itself in 25 years, simple interest? 4 per cent.
10. I bought a watch for £6, and sold it for £4; what did I lose per cent.? $33\frac{1}{3}$ per cent.
11. What is the amount of 20 guineas for $3\frac{1}{2}$ years at $2\frac{1}{2}$ per cent.? £22 16s. 9d.
12. If an article be sold for £12 at a loss of 4 per cent., what is the prime cost? £12 10s.

Query Column.

RULES.

1. Each correspondent is restricted to *one question*. We should be much obliged if correspondents, who send questions for solution, would give (if possible) the required answer, and the source from which the question is obtained.
2. No query can be answered unless accompanied by the real name and address of the sender, not necessarily for publication, but as a guarantee of good faith and for facility of reference.
3. ☞ When a pseudonym is adopted it should be written at the end of the query, and the real name and address on a separate piece of paper.
4. Correspondents are requested to write their queries *legibly*, and on one side of the paper only.
5. Replies will not be sent through the post.
6. Queries must reach the office *not later than the 12th of the month*, or they cannot be attended to in the following issue.

*** All communications for this column should be addressed—'*The Query Editor*,' *The Practical Teacher*, *Pilgrim Street, Ludgate Hill, London, E.C.*

General.

1. LUNE.—The numerical working of your query would take up too much room for a question of so little general interest. The result can be obtained by Trigonometry, taking the area of the Lune as the sum of the areas of the segments of the two circles. If angle HTR = θ, then angle HCT (C being the centre of the first circle) = $180° - 2\theta$.

2. TOM.—We shall be pleased to answer your queries if you will write them clearly and correctly. The first one is perfectly unintelligible. In the second one NC appears nearly at the end and has previously not been mentioned. Is it meant for AC? Please repeat your queries.

3. A. H. M.—We are not aware that the change has already taken place yet, and could not therefore promise to supply the questions set. There is no harm in your writing as you propose. Your main guide will be the syllabus. Formerly two solutions were given, containing not more than two acids and two bases, either organic or inorganic.

4. MAGISTER.—Only students and acting teachers can sit, and you are neither. If you are in doubt write to the secretary of the department and ask; or write to the Inspector of the school in which you served.

5. MERTHYR TYDVIL.—Most probably.

6. VOLUNTEER.—Write to the War Office. You will get the information you require.

7. J. J. PATERSON.—Huxley's Physiography. You cannot have a better companion to the one you name.

8. H. M.—Arrangements have been made for publishing the parts named, with all necessary explanations, in this magazine in good time.

9. ANXIOUS ONE.—There is only one for the country. Any good manual will do. Have you seen Jones'? Try it.

10. H. W. L. R.—Give the kind of geography you want. For Euclid and algebra Hall & Knight's will suit you.

11. LINNÆUS.—Candidates are selected. Mere application will not be enough. You have good qualifications. Write to the department and state them. You are a science teacher, and, so far as we can judge, the sort of student likely to be selected.

12. CONSTANT READER.—No, it does not. If you obtain a sufficient number of marks in the other subjects you will pass, notwithstanding the mishap you name.

13. AN ANXIOUS ONE.—You can be examined in a subject in which you have not attended any class, but you must go to a place for examination which the department fix upon. That might be a long way. Write to the Secretary, Science and Art Department, S.W.

14. W. H.—'Golden Treasury of Songs and Lyrics' is published by Macmillan, 4s. 6d. Trench 'On the Study of Words' is published by Macmillan, 5s. There are several editions of Lock's 'Thoughts.' Daniell's is good. The sections required will be published in this journal. 'Macbeth,' Clarendon Press edition. See also the '*Practical Teacher*.' Bacon's 'Essays,' several editions. Storr's and Abbott's are excellent; other and cheaper ones would do.

15. SELSEY BILL.—(1) Yes, read both. H. M. I. will choose, not you. If you take *a*, *b*, *c*, *d*, you cannot take Economy. (3) No. (4) Gray's Odes and Elegy, Bradshaw's, Macmillan. Repeat questions on the other two.

Mensuration.

1. SCRIBE.—A man had two daughters; to one he gave a round piece of land, to the other a square piece. Each was valued at £20 per acre, and the shillings that did encompass each paid for it. If the diameter of a shilling be one inch, how much does the square exceed the circle?

Area of circle = $\frac{1}{2}$ circumference × $\frac{1}{2}$ diameter
= $\frac{1}{2}$ circumference × $\frac{1}{2}$ of $\frac{7}{11}$ of circ.
= $\frac{7}{88}$ of circumference^2;

Value of circular piece of land
= [(Circumference in yards)^2 × $\frac{7}{88}$ × $\frac{20}{4840}$]£;

$\therefore$ (circumference in yards)^2 × $\frac{7}{88}$ × $\frac{\overset{10}{\cancel{40}}}{\underset{121}{\cancel{484}}}$
= Circumference in yards × 36,

Circumference in yards × $\frac{70}{88 \times 121}$ = 36,

$\therefore$ Circumference = $\frac{36 \times 88 \times 121}{70}$ yards.

Area of circular piece of land
= $\frac{7}{88}$ of $\left(\frac{36 \times 88 \times 121}{70} \text{ yards}\right)^2$

= $\frac{\overset{1}{\cancel{7}} \times 36 \times \overset{1}{\cancel{88}} \times 121 \times \overset{9}{\cancel{36}} \times \overset{1}{\cancel{88}} \times \overset{11}{\cancel{121}}}{\underset{10}{\cancel{88}} \times \underset{10}{\cancel{70}} \times \underset{10}{\cancel{4840}}}$ acres

= $\frac{3449952}{7000}$ acres
= $492\frac{4452}{7000}$ acres.

Value of square piece of land
= [(side in yards)^2 × $\frac{40}{484}$]£;

$\therefore$ (side in yards)^2 × $\frac{40}{484}$ = side in yards × 36 × 4,
side in yards × $\frac{10}{121}$ = 144,

$\therefore$ Side = $\frac{144 \times 121}{10}$ yards.

Area of square piece of land
= $\left(\frac{144 \times 121}{10} \text{ yards}\right)^2$

= $\frac{144 \times 121 \times \overset{36}{\cancel{144}} \times \overset{11}{\cancel{121}}}{10 \times 10 \times \underset{10}{\cancel{4840}}}$ acres

= $\frac{2612736}{4}$ acres
= $627\frac{936}{1000}$ acres.

$\therefore$ Difference = $(627\frac{936}{1000} - 492\frac{4452}{7000})$ acres
= $134\frac{5388}{7000}$ acres.
= $\underline{134\frac{1347}{1750}}$ acres. Ans.

Algebra.

1. J. S. L.—If $a + b + c = 3s$, show that
$(s-a)^4 + (s-b)^4 + (s-c)^4$
$= 2[(s-b)^2(s-c)^2 + (s-a)^2(s-c)^2 + (s-a)^2(s-b)^2]$
If $a + b + c = 3s$,
Then $(s-a) + (s-b) + (s-c) = 0$;
Put x, y, and z for $(s-a)$, $(s-b)$, $(s-c)$ respectively.

$$x + y + z = 0$$
$$x + y = -z$$

Squaring] $x^2 + y^2 + 2xy = z^2$
$$x^2 + y^2 - z^2 = -2xy$$

Squaring] $x^4 + y^4 + z^4 + 2x^2y^2 - 2x^2z^2 - 2y^2z^2 = 4x^2y^2$
$\therefore x^4 + y^4 + z^4 = 2y^2z^2 + 2x^2z^2 + 2x^2y^2$;

Substituting the values for x, y, z, we have
$(s-a)^4 + (s-b)^4 + (s-c)^4$
$= 2[(s-a)^2(s-c)^2 + (s-a)^2(s-c)^2 + (s-a)^2(s-b)^2]$,

2. OLD MAN OF CARMEL.—Solve:—

$$\left.\begin{aligned} x + y + z &= d \\ ax + by + cz &= d^2 \\ a^2x + b^2y + c^2z &= d^3 \end{aligned}\right\} \text{ (Easton's 'Factors.')}$$

$$\left.\begin{aligned} (1)\quad x + y + z &= d \\ (2)\quad ax + by + cz &= d^2 \\ (3)\quad a^2x + b^2y + c^2z &= d^3 \end{aligned}\right\}$$

$$\left.\begin{aligned} (1)\quad cx + cy + cz &= cd \\ (2)\quad ax + by + cz &= d^2 \end{aligned}\right\}$$

$$(a-c)x + (b-c)y = d^2 - cd$$
$$= d(d-c). \quad (4)$$

$$\left.\begin{aligned} (1)\quad c^2x + c^2y + c^2z &= c^2d \\ (2)\quad a^2x + b^2y + c^2z &= d^3 \end{aligned}\right\}$$

$$(a^2-c^2)x + (b^2-c^2)y = d^3 - c^2d$$
$$= d(d^2 - c^2). \quad (5)$$

$$\left.\begin{aligned} (4)\quad (a-c)(b+c)x + (b^2-c^2)y &= d(b+c)(d-c) \\ (5)\quad (a^2-c^2)x + (b^2-c^2)y &= d(d^2-c^2) \end{aligned}\right\}$$

$$[(a^2-c^2) - (a-c)(b+c)]x = d[(d^2-c^2) - (b+c)(d-c)]$$
$$(a^2 - c^2 - ab - ac + bc + c^2)x$$
$$= d(d^2 - c^2 - bd + bc - cd + c^2)$$
$$(a^2 - ab - ac + bc)x = d(d^2 - bd + bc - cd)$$
$$[a(a-b) - c(a-b)]x = d[d(d-b) - c(d-b)]$$
$$(a-b)(a-c)x = d(d-b)(d-c)$$
$$\therefore x = \frac{d(d-b)(d-c)}{(a-b)(a-c)}.$$

$$(4)\quad (a-c)x + (b-c)y = d(d-c)$$
$$(b-c)y = d(d-c) - \frac{d(d-b)(d-c)}{a-b}$$
$$= \frac{d(d-c)[(a-b) - (d-b)]}{a-b}$$
$$\therefore y = \frac{d(d-c)(a-d)}{(a-b)(b-c)}.$$

$$\left.\begin{aligned} (1)\quad bx + by + bz &= bd \\ (2)\quad ax + by + cz &= d^2 \end{aligned}\right\}$$

$$(a-b)x + (c-b)z = d(d-b)$$
$$(c-b)z = d(d-b) - \frac{d(d-b)(d-c)}{a-c}$$
$$= \frac{d(d-b)[(a-c) - (d-c)]}{a-c}$$
$$\therefore z = \frac{d(d-b)(a-d)}{(a-c)(c-b)}$$
$$\text{or } \frac{d(d-b)(d-a)}{(a-c)(b-c)}.$$

Note.—No marks are given for Mathematics. The subjects are:—Mechanics; Chemistry; Animal Physiology; Acoustics, Light, and Heat; Magnetism and Electricity; Physiography; Botany; Principles of Agriculture.

Arithmetic.

1. JUVENIS.—Determine the heaviest unit for which ·0064 ounces will be represented by an integer. (*Barnard Smith.*)

·0064 oz. = ·128 dwt.
= 3·072 grs. = $\frac{3072}{1000}$ grs.
= $\frac{384}{125}$ grs.;
$\therefore$ Heaviest unit = $1\frac{1}{125}$ gr.
= $\underline{\cdot008 \text{ gr.}}$ Ans.

2. APOLLONIUS.—The metre being 1·0936 yards in length, find a series of integral numbers of metres, which are nearly equal to integral numbers of yards. (*Elste's* 'Arithmetic.')

10	metres	= 10·936 yds.	= 11	yds.	nearly;
11	,,	= 12·0296 ,,	= 12	,,	;
21	,,	= 22·9656 ,,	= 23	,,	;
22	,,	= 24·0592 ,,	= 24	,,	;
31	,,	= 33·9016 ,,	= 34	,,	;
32	,,	= 34·9952 ,,	= 35	,,	;
&c.,			&c.		

The nearest to integral numbers of yards are therefore:—
10, 11, 21, 32 metres, &c.

COME, ROUSE UP YE SLOTHFUL.

Tune:—'*Derry Down*,' or '*A Cobbler there was*.'

1st TREBLE.
2nd TREBLE.
BASS.
1. Come, rouse up ye sloth - ful the sun's on the hill, The
2. Your coat from the nail and your hat from the wall, The
3. And while you are toil - ing your thoughts raise on high, For
KEY G. Lah Mode.
birds are all sing - ing by moun - tain and rill. The
cat - tle to pas - ture, the horse from the stall. A -
bless - ings to man al - ways come from the sky. From
riv - er is spark - ling with sil - ver and gold; The cat - tle are low - ing, the
way to the gar - den, a - way to the field! For food with - out la - bour it
thence come the sun - beams, the rain and the wind; Who di - li - gent plough - eth rich
sheep leave the fold, Der - ry down, down, down, der - ry down.
nev - er will yield, Der - ry down, down, down, der - ry down.
har - vest shall find, Der - ry down, down, down, der - ry down.

How a Scotch School was Examined.

ON entering the room the Inspector asked for a list of songs. Out of eight he chose one, and after that other two of the teacher's choosing were given.

Modulator Exercise:—d m t d' l f r l, t, fe se d t r f m l, t, r se f e m d. l, t, d r m ba se l s f m r d t, l, d &c.

A test piece in two parts was written on blackboard.

Ear Exercise on Harmonium:—m l s d; r f t, d; d' l se l; r m f d; s fe l s—These for the higher Standards. d r m; m f s; l s f, &c., for the lower Standards.

For a voluntary d and m, r and f, s and t were sounded together and several children could tell the two notes. One little fellow distinguished r and high t played together.

After finishing this part of the examination the Inspector went to the Infant Department. During his absence the Standards were arranged for the written examination.

INFANTS.

Song.—This is the top of my little head, &c. (action).

Modulator:—d s m d' m d s d' t l s m r f l, &c.

Object Lesson.—The Ostrich.

Reading.—3rd Class: Blackie's Primer, Part I. Each child read a line and spelt such easy words as dog, man, &c.

Writing.—Small letters s t u; figures 2, 3, 4.

Arithmetic.—2 and 3? 5 and 3? 4 and 5? 2 from 6? 4 from 7? 5 from 8? How many legs have two cows got? I had 6 cows and sold 4, how many left?

Reading.—2nd Class: Collins's Infant Reader. Every second child read a sentence, and spelling was taken from lesson read.

Writing.—Each child made six different letters, three capital and three small, as—(1) Aa, Bb, Cc, (2) Dd, Ee, Ff, &c.

Arithmetic.—5 and 4? 6 and 5? 7 and 6? 4 from 9? 2 from 11? 4 from 10? How many legs have 3 cows? How many half-pennies make 3d. Had 12 marbles, lost 8; how many left?

Reading.—1st Class: Blackie's Primer, Part II. Only a few were asked to read. Spelling: such words as please, school, short.

The meaning of single words from the lesson read.

Writing.—Each child was asked to make three capital and three small letters; tested quite the same as the 2nd Class.

Arithmetic.—The children in this class were questioned individually—8 + 9? 7 + 6? 13 + 7? 19 + 8? 16 − 7? 12 − 4? 17 − 8? 14 − 10? Got 20 marbles, lost 14; how many left? How many pennies in two shillings? How many 4's in 16, &c.

Sewing.—A. Hem 5 inches in one colour.

B. To knit 6 rows of 12 loops previously cast on.

STANDARD I.

Reading.—Chambers' Graduated and Star Readers. Half the class read from one book and half from the other. Spelling asked from every one, and questions given on the meaning of words and phrases.

Writing.—Transcribed a line from their own book.

Arithmetic.—(1) 989 + 777 + 685 + 739 + 845. 4035. Ans.

(2) 917 + 80 + 909 + 16 + 9. 1931. Ans.

(3) 987 − 96. 891. Ans.

Sewing.—A. To work in two colours (so as to show join) a hem of 5 inches.

B. To knit 12 rows of 12 loops, with chain edge and cast off.

C. To work a sew and fell seam of 5 inches.

STANDARD II.

Reading.—Chambers' Graduated and Star Readers. The boys read from the former and the girls from the latter. The Inspector was very particular, both in I. and II. Standards, to have the proper inflection and modulation of voice, in order to give the proper sound to the sense. The children professed to know verbs, nouns, and adjectives.

Writing.—Copy books shown.

Dictation.—'As the two knights came up to the statue from opposite ways, each saw but one side of the shield: one saw the iron . . .'

Arithmetic.—1. 9,060 + 17 + 8,490 + 4,009 + 6,785 + 494 + 7,060. 35,915. Ans.

2. 8,047 − 949. 7,098. Ans.

3. 8,549,367 × 6. 51,296,202. Ans.

After working these the slates were collected, and marked by the second master. Slates were thereafter piled according to passes in 3, 2, or 1 sum, and the Inspector glanced over all to satisfy himself.

Sewing.—A. To work a sew and fell seam of 5 inches in cotton of two colours, so as to show a join in both seam and fell.

B. To cast on 12 loops and knit 12 rows purl and plain, and afterwards cast off.

STANDARD III.

Reading.—Nelson's Star and Scottish Historical Readers. Boys read from the former, girls from the latter.

Grammar taken from reading lesson, and was not very difficult.

Writing.—Copy books looked.

Dictation.—'Suddenly a cry was heard—a cry of terror and dismay—for flames burst forth from the room in which the children slept! All hope seemed now gone. The mother gazed in despair upon the sight: she could not speak. Her grief was terrible to behold.'

Arithmetic.—Cards, one of which was (A.): 1. Multiply seven hundred and fourteen thousand and fourteen by seven thousand and fourteen.

5,008,094,196. Ans.

2. Divide 139,648,723 by 179.
780,160$\frac{83}{179}$. Ans.

3. Find the 37th part of five hundred thousand four hundred. 13,524$\frac{12}{37}$. Ans.

4. Add £86 5s. 6d., £600 16s. 8½d., £91 7s. 4¼d., £105 10s. 9¾d. £884 0s. 4¾d. Ans.

History.—A pupil teacher examined the class on the 'Life of Queen Mary.'

Geography.—The Inspector tested them on the general features of Scotland, and wound up with some questions about the principal seats of trade, and the towns situated in them.

Repetition.—'The Beggar Man.' Some of the boys suited the action to the word, which pleased very well.

Sewing.—A. To fix for stitching and work not less than half of 5 inches, and sew on a string.

B. To cast on 30 loops and knit with 4 pins 10 rounds, breaking and joining the cotton once, and cast off.

C. To darn on canvas 20 rows 1½ inches long, and work 3 inches of herring-boning.

STANDARD IV.

Reading.—Nelson, Star, and Scottish Readers. The Star was the only book taken, and the reading was severely tested. Meanings were asked, and Grammar and Analysis taken from reading book.

Writing—Dictation.—'On the approach of the hunter it greets him with a loud yelp, and retires into its burrow, but only to put forth its head again to watch the stranger's movements. It changes the colour of its coat according to the season. In winter it is pure white, and cannot at a distance be distinguished from the snow among which it lies. In summer it is of a beautiful gray.'

Arithmetic.—One card is given as a sample.

1. Multiply £37 11s. 8½d by 370.
£13,906 12s. 1d. Ans.

2. Divide £8,963 17s. 8d. by 87.
£103 0s. 7¾d. $\frac{71}{87}$. Ans.

3. Multiply 3 acres 1 rood 17 poles by 307.
1,030a. 1r. 19p. Ans.

4. Reduce 2 cwt. 1 qr. 13 lbs. to ounces.
4,240 oz. Ans.

Repetition.—'Llewellyn and his Dog.' A verse asked from one here and there in the class. The Inspector gave the first two or three words, and the pupil finished the verse. Meanings of words and phrases as in Standard III.

History.—A list of the sovereigns of the period, with their families and consorts asked. Dates required, and a pretty minute examination on the Commonwealth was then taken.

Sewing.—A. Gather and stroke down 7 inches and fix into a band 3 inches, and set in 1½ inches.

B. To put in a flannel patch about 2 inches square.

C. To mark on canvas the letters J. L., and darn a hole in stocking material.

STANDARD V.

Reading.—Star Reader No. 6 and Historical Reader No. 5.

They read only from No. 6, and, as before, the reading was severely tested. The Grammar and Analysis were not very difficult. Questions were asked on the structure of complex sentences. What was a principal sentence? What a subordinate? Give an example.

Repitition.—This was taken with Standard VI., and consisted of an extract from 'The Merchant of Venice.' The Inspector was very particular as to the style of repeating the passage, and the pupils were required to speak to their neighbours when the part suited. Not many questions were asked either for meaning of words or phrases; but the teacher was asked to give them a lesson on prefixes, affixes, and the composition of words.

Writing.—The following story was read twice, once by the teacher and a second time by the Inspector:—'A jewel merchant, on arriving in Paris, was asked by an officer of police, who met him at the railway station, to accompany him to the presence of the chief director of police. He was received with great politeness, and to his surprise found that not only did the chief know his position, but that he had accurate information about the kind and amount of some valuable jewels he carried in his bag.

'The chief then said to him, "Sir, you are to be robbed and murdered to-night. You must not fall asleep, but keep awake till half-past twelve, at which hour the attempt will be made. Don't search your room before retiring, or excite your servant's curiosity, but leave everything to me."

'The merchant followed these directions and found everything happen as he had been informed. At half-past twelve three men—one of them his own servant—entered the room. After rifling the bag, they began to settle how they would kill him. Just then the chief with a number of police burst into the room, secured the thieves, and took them off to prison.'

Arithmetic.—One card was as follows:—

1. Find by practice the value of 862 articles at £5 16s. 10¼d. each. £5,036 8s. 3½d. Ans.

2. Make out in proper form this bill:—
15½ lbs. of coffee, at 1s. 8d. per lb.
7 boxes biscuits, at 1s. 10½d. each.
17 lbs. raisins, at 2s. 5d. per lb.
30 lbs. tea, at 2s. 8d. per lb.
£1 5s. 10d. + 13s. 1½d. + £2 1s. 1d. + £4.
= £8 0s. 0½d. Ans.

3. If the carriage of 1 ton 1 qr. for 150 miles be £3 9s. 4d. what weight would be carried the same distance for 8s. 8d.? 10 qrs. 3 lbs. 8 oz. Ans.

4. Add together ½, ⅓, ¾, and divide the result by 3.
$\frac{19}{36}$. Ans.

History.—The teacher examined the class on the reign of George I.

Geography.—Europe was taken pretty minutely, and then some questions were given on Australia.

Sewing.—A. To cut out and tack together the pattern of a child's pinafore; also cut and work a button hole.

B. To darn a hole in stocking material and mark on coarse linen the letter J.

STANDARD VI.

Reading.—Star Reader No. 6, and Scottish Historical Reader.

They read parts of three lessons. When analysing, he called upon one to count the number of sentences in a passage, and say what kind of a sentence they formed, complex or compound, and why.

Repetition as in Standard V., which see.

Writing.—Essay on 'A Holiday Excursion.'

Arithmetic.—One card as follows:—

1. If 7 men mow 37 acres in 3 days of 8 hours each, how many men will mow a field twice the size, working 4 hours longer in 7 days? 4 men. Ans.

2. Simplify $3\frac{1}{6}$ of $\frac{8}{57} + \frac{6\frac{1}{6} - 5\frac{4}{5}}{6\frac{1}{6} + 5\frac{1}{5}}$ $\frac{133}{270}$. Ans.

3. Reduce to vulgar fractions ·27, 1·06, ·0021, ·590. $\frac{3}{10}$, $1\frac{1}{15}$, $\frac{7}{3330}$, $\frac{13}{22}$. Ans.

4. Find the simple interest on £434 16s. 8d. for $4\frac{1}{2}$ years at 5 per cent. per annum. £97 16s. 9d. Ans.

History.—Reign of Queen Victoria, with a list of Prime Ministers.

Geography.—Questions on Australia and New Zealand.

Maps of India, Australia and South America.

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How to Teach School Children to Sing from Notes.

BY W. G. McNAUGHT,

Associate of The Royal Academy of Music.

DIVISION III.—STANDARDS III. AND IV.

CODE REQUIREMENT.

Song Test.

To sing in unison, in good time and tune and with due expression, a school song (set to words). Five songs to be prepared. Rounds or two-part songs may be offered in place of unison songs.

118. Sections 70 to 80 in the numbers for August and September dealt with modes of teaching songs to Division II. In Division III. a better class of school songs and a better quality of voice and intelligent expression will naturally be looked for. Part singing should be commenced, although it is not required at the examination.

119. It should be observed that the requirements still ask for *school* songs. The five selected should not be all in one style. A little thought will enable a teacher to choose songs that differ in key, measure, rhythm, or general expression. Choose at least two that depend for effect upon sweet tone and sympathetic expression rather than upon dash and march-like rhythms. The songs chosen can be sung from book or from memory. If part singing is attempted it is unwise for altos to do entirely without the book, because errors gradually creep in that are very difficult to stamp out.

120. It is sometimes complained, and very justly, that the school music practised in elementary schools has only an ephemeral utility and it is suggested that classical music should be learnt, because of its value in after life. A writer in the Blue Book, 1887—1888 (p. 361), advocates the use of 'modern ballads, standard music, and the treble part of well-known glees.' It would certainly be a great gain for music if children could be taught in school to admire and enjoy glees and other standard music, but can one in fifty of our schools attempt such music with a chance of success? It is enough to point out that the words of most modern ballads are quite unsuited to children, and that a well played pianoforte accompaniment is generally an indispensable part of the effect; that the treble parts of most glees are not interesting in themselves, and that if the other parts are to be played an instrument and a good player must be provided. Moreover, the compass of the treble parts of glees is mostly too high for children, certainly for those children with alto voices; and in the case of boys, whose voices will, of course, settle into tenor or bass, the future utility of the treble part is out of the question. In face of these obstacles most teachers must perforce be content to choose music specially adapted for their resources.

121. Part singing in some form should be attempted in this Division as soon as possible. The longer only unison singing is practised the more difficult it will be to get good part singing. The teacher has at the outset two objects to look after. He has to find out the pupils with low voices or those with high voices, and he has to devise means of practice whereby his low voices can learn to hold an alto part against a treble part.

122. The practice of rounds affords the best means of sorting a class into trebles and altos and of accustoming pupils to part singing.

Plan for Dividing a Class for Part Singing.

Thoroughly teach the melody of a simple round that has a range of not more than an octave. The following is a suitable specimen:—

Uncurbed Tongues.

Doh is F. Round in four parts.

1. | d .d :d .t_1 ,d | r .r :r .d |
   Un - curbed ton - gues out-run their mas - ter.

2. | m .m :m .r ,m | f .f :f .m |
   Chat - t'ring fast and rail - ing fast - er.

3. | s :s | s' :— |
   Art thou deep,

4. | s_1 :s_1 | s_1 :— ‖
   Si - lence keep.

When this can be sung fluently in unison the teacher should (1) sing a part against all the class, (2) sing against each half of the class in turn, (3) make each half of the class sing against the other, (4) join in to make a third part, (5) divide the class into three parts and let each enter in turn, (6) sing a fourth part against the three, (7) divide the class into four parts. When the class has succeeded in keeping the four parts going the time has arrived for examination of voices and holding power. The teacher should go amongst the pupils and notice those who sing the low notes firmly and steadily and with a good body of tone. This experiment can be repeated again and again, until a good number of altos have been identified. When these are seated together (on the right of the teacher) the two groups should be practised

separately with modulator and other tune exercises. It will be found, of course, that there are still remaining on the left the pupils possessing low voices but unable to keep low notes against a higher part. As these are discovered they should be placed on the extreme right, so as to have the best altos wedged between them and the treble. They will probably soon run with the stream of alto in their neighbourhood. All the pupils on the left should not be assumed to be trebles because they are not altos. A watchful teacher will discover some who have but little voice and who strain painfully for any notes higher than about C[1]. All such should be brought to the front and told either not to sing at all or else made to leave out high notes.

123. It may be said that the process of sorting described is unnecessarily elaborate and that there is no time for such care to be given. Many teachers adopt readier and rougher ways of classifying, 'to save time.' But it cannot be said too plainly that it would be better to have no singing at all than to go on inflicting upon uncomplaining children the pain and irremediable injury often caused by an unnatural use of the voice. How to treat children's voices is really a more important matter than how to teach them to sing note and other tests.

124. A simple two-part song, in which the two parts move together in rhythm, should now be selected for study. The altos should be taught their part first. After the trebles have got hold of their part all the altos and a few of the trebles should sing the two parts, more trebles being added as the altos show confidence and ease. If the alto part once gets thoroughly established it is a comparatively easy matter to keep it going. New comers soon fall into the way.

DIVISION IV.—STANDARD V. AND UPWARDS.

125. The children in this Division are expected to study tune passages containing changes of key indicated by bridge notes, and passages in the minor key or mode, pulse and half notes, quick six pulse measure, ear exercises of four tones, and to prepare two-part music.

CODE REQUIREMENT.

Tune.

Note Test. (*Written or printed.*)—1. To Sol-fa slowly, any simple diatonic prssage in the major key; also a similar simple passage containing a transition of one remove indicated by bridge notes.

Examples:—

Doh is D. A.t. f.D.

(1) **d m s f m r d s ˌd t_1 d m r t_1 ˌs f m s l t d^1 ||**

Doh is E♭. f.A♭.

(2) **d s m f r d m s d^1 ^{1}s f m r f m r }**
E♭.f.
m l t d^1 s m d m r l s t_1 d ||

Also, to Sol-fa a short passage in the minor key or mode, introducing **se** used thus—**l se l** but without introducing **fah, ba,** or **soh.**

Doh is C. Lah is A.

Example:—

l t d^1 t l se l t d^1 l r^1 d^1 t l d^1 t l se l ||

126. The side columns, the first to the right and the first to the left on the modulator, must now have close attention. An elaborate demonstration of what happens when a key is changed is quite unnecessary at first. The points to make clear from time to time are: that **doh** is called the key-tone of the scale; that when the sound of the **fah soh,** or of any other tone of the scale we start in, is adopted as a new **doh,** the key is said to be changed; that when **soh** becomes **doh** the new **te_1** is the same as **fe** and that when **fah** becomes **doh** the new **fah** is the same as **ta**; that the change may be made upon any tone of the scale that has a tone level with it in the side column, and that the tone on which the change is made is called the *bridge note.* The fact that when the pointer moves from column to column one tone becomes another without altering its pitch is the supreme fact for the pupil to understand.

127. It is best to commence with changes, or *transitions* as they are termed, to the right hand column. A few phrases patterned by the teacher will soon enable the class to grasp the nature of their task. Thus the teacher may point and sing, say:

			Changes to right hand column.
d^1	f		
t	m		
		1.	d m d s s ˌd t_1 d
l	r		
		2.	s m d m ᵐl t_1 d
s	d		
fe	t_1	3.	d r m r ʳs t_1 d
f			
m	l_1	4.	m s d s l ¹r d t_1 d
r	s_1	5.	s m d d $^4f_1$ s_1 l_1 t_1 d
d	f_1		

the pupils singing each phrase after the teacher and then again through them all without the pattern.

(To be continued.)

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Model Essays for Pupil Teachers.

BY C. J. DAWSON, B.A.,
Ex-President of the N.U.E.T.

X.

A class of subjects which is often represented in the composition exercises set in examination papers, and for which the candidate should, therefore, be prepared, may be described as coming under the category of social questions. If one of these is chosen it is usually one that has just come into prominent notice through the ordinary means of public discussion, or the circumstances of the time.

The best preparation for dealing with such questions is no doubt to be found in listening to good debates on them, and, if possible, taking part in such debates. Next to this comes the reading of such summaries of public discussions as appear in the leading articles of the best newspapers or in essays contributed to monthly and other reviews.

We propose to take for our specimen essay of this type, the subject of 'Poverty in Great Cities.' Treating of this as a generally recognised evil of our time, we may take the following outline notes as our basis:—

Poverty in large cities a difficult and pressing problem. Its symptoms—Appearance of people. Statistics of pauperism. Cases of distress and starvation. Causes—Crowding of country population to towns. Want of suitable training. Excessive competition in trade and manufactures. Sweating. Idleness and other defects of personal character. Consequences—Over-crowded dwellings, dirt, disease, deterioration of race, excessive mortality, intemperance and crime. Remedies—Poor law administration, emigration, private benevolence, more rational system of education, improved land system.

We have given this outline as an example of the form in which the student may with advantage lay down the plan of his work. We would, however, again remind him that he should regard such an outline as a guide to help him, and not as an authority from which no deviation is permissible.

POVERTY IN GREAT CITIES.

There is scarcely any problem connected with social life in the present day, which is more generally recognised as urgent and difficult of solution than that presented by the poverty in our great cities.

The signs of this serious evil are but too evident to all observant people. It forces itself upon our attention in the crowds of wretched-looking, ill-clad persons who may be seen in many quarters of any large city, especially in the pale wizened faces of ragged, dirty, and neglected children that issue from the slums. Statistics of pauperism show us that in London alone as many as one hundred thousand persons per week are in receipt of parish relief, and this gives us an inadequate idea of the extent of the poverty; for many will endure the greatest hardship before they will submit themselves to what they consider the disgrace of receiving such help; and many more are prevented from needing it only by the kind interposition of charitable friends and the benefits of charitable institutions. In spite of the operation of the poor law, of private charity, and organised philanthropy, our feelings are often shocked by narratives of the deepest distress, and even of deaths from starvation.

Thoughtful people cannot become acquainted with the facts about the existence and extent of this poverty without having their attention directed to its causes and consequences, nor without some kindling of desire for the discovery of such remedies as may be possible. The conclusion to which most students of the problem are driven, is that any remedy to be of permanent value must deal with the causes rather than with the consequences. The root of the evil must be struck at rather than the branches.

One of the chief causes of the evil, undoubtedly, is that the populations of our large towns are abnormally increased by immigration from the country districts. Many labourers earning small wages in the country are tempted to leave their homes for the town by the hope of better wages and brighter prospects, only to be disappointed when they find that the greater demands on their earnings, and the less favourable conditions for a healthy life, make their position worse than it was before.

Another circumstance which is partly responsible for the poverty of many people, is their lack of technical and industrial training. Children leave school at an early age, and, tempted by the prospect of what is for them a considerable weekly wage, enter upon duties that require no special training. Thus they are not prepared for any permanent trade; and when they become a little older, they have to make way for successors of the same type, while in too many cases they are compelled to join the ranks of the unemployed. The decay of the apprenticeship system, and the widely extended use of machinery, have probably much to do with this result. The increased keenness of competition must also be reckoned a most potent cause of poverty.

A Royal Commission has recently been inquiring into what is generally known as 'Sweating,'—a system which is said to produce much distress among the poorer working people; and the general tendency of the evidence already produced seems to show that Sweating is carried on to a large extent in London and many of the large towns in the provinces. Sweating may be described as the employment of labour by capitalists paying the lowest possible wages for which they can find people to work. For the produce of this labour they charge considerably more than they pay, and thus largely increase their own wealth at the expense of the actual workers. As examples of the payments made under this system, it may be mentioned that as low a price as 2½d. is paid for making a gross of match-boxes, and poor women have to make a man's shirt for threepence or fourpence. The poverty created by this system is almost incalculable.

The causes upon which we have dwelt are mainly those of a general character; for we have considered the question as a social one. There is, however, much poverty to be attributed to moral causes in the character of individuals. Idleness, intemperance, dishonesty are fruitful causes of distress. But these are causes which for the most part are within the control of the individuals who suffer through them; and as such we do not further deal with them in this place.

The symptoms of the evil have been already referred to, and may be regarded as among the consequences. It seems proper, however, to mention, as one result of poverty, the over-crowding which so lamentably prevails in London and other large towns. The extremely small earnings of many workers will not permit of a sufficient outlay to secure adequate house-room in places where the ground has an abnormal value from the great and increasing demand combined with the limited supply. Intimately connected with over-crowding, are the further consequences of poverty,—dirt, insanitary conditions, disease, and excessive mortality.

Again, though intemperance and crime may often be causes of poverty, there can be no doubt that poverty often drives people to seek forgetfulness of their distress in drunkenness, or a temporary relief from it through dishonest means. There are instances where men have been driven by their poverty to commit petty offences against the law, simply for the sake of getting the temporary shelter and food afforded by the prison.

The remedies which have been tried to mitigate the evil of poverty have hitherto proved very inadequate. This is probably because they have dealt only with the poverty itself, and have not touched its sources. The institution of the workhouse, and the doling out of parish relief, have both fallen far short of what their originators expected of them. Pauperism has come to be looked upon as a disgrace by the respectable poor, though this is possibly on account of the way in which public or official charity is often administered.

Private benevolence does much to alleviate distress in individual cases, and in large classes of cases of a special nature. Thus our numerous hospitals afford relief to those suffering from accident or disease; homes and asylums are provided for poor orphans, for the blind, the deaf and dumb, and for the insane. But charity of this kind cannot effectually deal with the great mass of general poverty.

One remedy proposed is emigration. This might do much good if it could be adopted on any large scale; but many of the poorest people would regard leaving their homes, however poor, as an extreme hardship. Another difficulty arises from the fact that the effect of poverty is to lessen the energies and depress the spirits of its victims, who are therefore ill-fitted to cope with the task which awaits the settlers in a new land, and which demands in a special degree strength, courage, and perseverance. Such as possess these qualities have the best chance of success at home, and do not generally need the benefits of change.

A more rational system of technical and industrial education to follow and supplement that given in our day schools would help to lessen the evil of poverty, by enabling many to do skilled work, or to adapt themselves to different kinds of work, who can now only do such work as needs no training.

An increasing number of thinkers believe that the most effective remedy will be found in improved Land Laws. One of the chief roots of poverty, they say, lies in the injustice of the distribution of land and wealth. Laws have been made chiefly by the rich, and it is natural that they should be more favourable to that class than to the poor. 'Justice,' says Ruskin, 'is the great remedy. "Nay," you will say, "Charity is greater than justice." Yes, it is greater; it is the summit of justice; it is the temple of which justice is the foundation. But you can't have the top without the bottom, you can't build upon charity. You must build upon justice.'

The acts of justice to be done with regard to this question appear to be these: Let us revise the Land Laws, so that the labourer in the country may be tempted to remain there by a reasonable prospect of a happy and prosperous life on the soil which he tills. Let us give a sound liberal and technical education so that the artisan may be able to do something well. Let us pay such wages that every worker may have a fair share of the results of his labour.

If these changes can be accomplished, the evil of poverty, so far as it is a social and not an individual question, may cease to trouble us.

(To be continued.)

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How my School was Examined.

BY A

TEACHER IN THE MIDLANDS.

STANDARD I.

Arithmetic.—Two sets of sums were dictated.

A. (1) 289 + 13 + 300 + 742 + 83.
(2) 907 − 76.
(3) 190 − 83.

B. (1) 374 + 39 + 476 + 682 + 75.
(2) 900 + 186 + 35 + 741 ÷ 8.
(3) 760 − 81.

Answers:—*A.* (1) 1,427; (2) 831; (3) 107.
B. (1) 1,646; (2) 1,870; (3) 679.

Writing.—Ten words dictated:—*Proud, Butter, Cheese, Stick, Horse, Picture, Large, Raven, People, Carpet.*

STANDARD II.

Arithmetic.—Two sets of sums were dictated.

A. (1) Take 76,087 from 80,469.
(2) Multiply 49,671 by 87.
(3) Divide 61,015 by 7.
(4) What is the value of 54 pence? 77 pence? 89 pence? 101 pence? 113 pence?

B. (1) Take 19,092 from 116,085.
(2) Multiply 73,095 by 690.
(3) Divide 10,973 by 4.
(4) How much is equal to 33 pence? 71 pence? 87 pence? 117 pence? 141 pence?

Answers:—*A.* (1) 4,382; (2) 4,321,377; (3) 8,716 + 3.

B. (1) 96,993; (2) 50,435,550; (3) 2,743 + 1.

Writing.—The passage dictated was as follows:—

'In the depth of winter, when the snow is on the ground, a wild howl is often heard in the stillness of the night. And in the morning the loss of a cow or horse tells the people that they have had a visit from the wolf.'

STANDARD III.

Arithmetic.—The following are questions which appeared on the cards:—

(1) Divide one hundred and thirty-five thousand and ninety-eight by seventy-nine.

(2) Take nineteen pounds seventeen shillings and nine pence farthing from eleven thousand one hundred pounds twelve shillihgs and nine pence.

(3) Add £69 18s. 4¼d. + £1,098,091 13s. 11d. + £39, 742 11s. 3¼d. + £116,374 12s. 9½d. + 11¾d. + £9 15s. 1¾d.

(4) I bought 127 penny toys, but had only 6s. 9d. to pay with; how much was I short?

(5) 398,614 ÷ 137.

(6) £109,190 15s. 9¼d. − £9,289 12s. 9¾d.

Answers.—(1) 1,710+8; (2) £11,080 14s. 11¾d.; (3) £1,254,288 12s. 5¾d.; (4) 3s. 10d.; (5) 2,836 + 82; (6) £99,901 2s. 11½d.

A five-lined addition was given entirely in words and contained the expression three halfpence.

Writing—Dictation exercise.

'During summer, each beaver lives by himself in a burrow, which he digs out near a lake or stream. When winter comes he quits this retreat and unites with his fellows to build a winter home. They generally combine in troops of from one to two hundred, so that the houses form a little beaver town.'

STANDARD IV.

Arithmetic.—Specimen cards.

A. (1) Multiply £619 13s. 7¾d. by 189.
(2) Reduce 4,317,540 seconds to weeks.
(3) Divide six thousand nine hundred and eighty-three pounds eleven shillings and ninepence into 118 equal parts.
(4) A man bought 5 cwt. of soap for £2 10s., and sold it at 2d. per lb. What was his gain?

B. (1) Multiply £709 12s. 10¾d. by 83.

(2) A man works 9 hrs. a day and gets 6¾d. per hour. At the end of the year he finds he has received £75 18s. 9d. How many days did he work?

(3) Divide £57,803 11s. 9d. by 73.

(4) Reduce 76 tons 96 lbs. to ounces.

Answers.—*A.* (1) £117,119 19s. 0¾d.; (2) 7 wks. 23 hrs. 19 min.; (3) £59 3s. 7¾d. + $\frac{66}{115}$; (4) £2 3s. 4d.

B. (1) £58,900 10s. 4½d.; (2) 300 days; (3) £791 16s. 7d. + 14; (4) 2,725,376 ozs.

Writing.—Passage dictated: 'It would be thought a hard government that would tax the people one-tenth part of their time to be employed in its service; but idleness taxes many of us much more; sloth, by bringing on disease, shortens life. "Sloth, like rust, consumes faster than labour wears, while the used key is always bright," as poor Richard says.'

Grammar.—Parse the following sentences, *A* and *B* given to alternate children:

A. We find its home in the decayed stump of an old oak.

B. The hardiest of flowers only grow out of doors.

STANDARD V.

Arithmetic.—A. (1) Make a bill for the following:—24 articles at 6½d. each, 15 articles at 1/1½ each, 100 reels of cotton at ¾d. each, 120 boxes at 9¾d. each, 13 books at 5½d. each, 72 pencils at 11/8 per gross.

(2) I had $\frac{7}{8}$ of a sovereign. I gave away $\frac{1}{3}$ of a sovereign, and then half of a sovereign. What fraction of a sovereign have I left?

(3) 24 men can do a piece of work in 40 days. How long would it take 50 men to do the same work?

(4) Find the value of 23 acres 3 rds. 5 pls. at £2 12s. 6d. per acre.

B. (1) Make a bill for the following:—37 yds. of calico at 9¼ per yd., 198 yds. of linen at 1/3¼ per yd., 8 handkerchiefs at 1/5½ each, 2 doz. pairs of gloves at 2/11¾ per pair, 52 toys at 5½d. each, 4 doz. toys at 1/4¾ per dozen.

(2) Find the cost of 121 gallons 3 quarts 1 pint at £3 9s. 8d. per gallon.

(3) Add together $\frac{3}{5} + \frac{5}{6} + \frac{3}{10}$.

(4) If a man walks 220 yds. in 3 minutes, how long will it take him to walk 3¾ miles?

Answers.—*A.* (1.) 13s. + 16s. 10½d. + 6s. 3d. + £4 17s. 6d. + 5s. 11½d. + 5s. 10d. = £7 5s. 5d.; (2) $\frac{7}{40}$; (3) 19½ days; (4) £62 8s. 6$\frac{3}{16}$d.

B. (1.) £1 8s. 6½d. + £12 11s. 7½d. + 11s. 8d. + £3 11s. 6d. + £1 3s. 10d. + 5s. 7d. = £19 12s. 8¾d.; (2) £424 10s. 7½d.; (3) 1$\frac{1}{15}$; (4) 1½ hrs.

Writing.—Passage dictated:

'Try what you can build up from the broken fragments of your time rendered more precious by their brevity. It is said that in the Mint the floor of the gold-working room is a network of bars, to catch the falling grains of the precious metal; and that, when the day's labour is done, the bars are removed, and the golden dust is swept up, to be melted and coined.'

Grammar.—Two different exercises were set to alternate children.

A. 1. Parse the words underlined and analyse the following sentence:—

'After a *careful search among* the *prickly* leaves one of her brown *speckled eggs* is added to her *spoils*.'

(2) Make nouns from confide, engine, locomotive, machine.

B. (1) Analyse the following sentence, and parse the words underlined:—

'*Armed* with a *poison fang*, the snake at one *stroke avenges herself* on the *unfortunate animal*.'

(2) Make verbs from strong, danger, breath, lock.

STANDARD VI.

Arithmetic.—(1) At what rate per cent. will £425 amount to £450½, if it be lent for one year only?

(2) Express ¼ of 6·175 of a ton in lbs.

(3) If I give away ⅜ and then ¼ of £22½, what have I remaining?

(4) A man gave ⅝ of his property to his son, and the remainder to his daughter. The difference in their shares was £50. What was the whole property worth?

Answers:—(1) 6 per cent.; (2) 3,458 lbs.; (3) £8 10s. 10d.; (4) £200.

Writing.—Write a letter comparing a long journey made in the summer with one made in winter.

Grammar.—(1) Parse the words underlined and analyse the sentence:—

'*As* they find by *experience* that snakes are *very docile, they easily train* them to *their own* liking.

(2) Give the prefix in each of the following words, and mention another example of its use:—

Subject, contradict, object, superhuman, compress, attract.

Science Notes.

FEW laboratory experiments have been more wonderful, more instructive or more important than those by which MM. Fougué and Michel Lévy have synthetically reproduced all the modern volcanic rocks. Into a furnace they introduced a platinum vessel containing the mixture out of which the rocks are to be formed. By the application of an intense heat the whole is raised to a white heat, and thereby converted into a glass. The temperature is then lowered and then kept at an orange heat, the fusing point of steel, for some time. The temperature of the crucible is then lowered to a cherry red, at which copper melts, and after a while lowered still further. This is the general method. Suppose it were required to reproduce leucotephrite, a rock which is found in the eruptions of Vesuvius. Silica, alumina, lime, ferric oxide, potash and soda are taken in suitable proportions. These are heated to a white heat. The glass is then cooled to the melting point of steel, and allowed to remain at it for 48 hours. During this time crystals of leucite separate out. The crucible is then subjected to the temperature of fused copper for 48 hours. The mass which remained after the crystals of leucite had fallen out is now transformed into microliths of augite and labrador felspar, with octahdra of magnetite and picotite. By the application of this method of

heating, and then allowing the mixture to stand at pretty constant temperatures for considerable periods of time, many other important results were reached. The origin of basalt, for example, was for a long time believed to involve the action of water. This has been found to be wrong. The conclusion seems justified that modern volcanic rocks in general have been formed by a fusion purely igneous.

***

WE learn from *Nature* that the Secretary of the Royal Botanic Society has reported that the recent fogs had done much damage to the plants in the conservatories, causing many of them to shed both leaves and flower buds. More especially was this the case with Australian plants, which from enjoying in their own country a large amount of sunlight, were found to be less cabable than any others in contending against the vicissitudes of London weather. It is thought that fogs are increasing both in London and elsewhere. Plants suffer not only from the absence of light but also from the pores of their leaves becoming filled up with the sulphurous sooty matter contained in London fogs.

***

IN the Kew Bulletin there is an interesting note on the Coca-plant, to which much importance has been attached on account of the valuable properties ascribed to one of its alkaloids called Cocaine as a local anæsthetic. Since the discovery of the anæsthetic properties of Cocaine the demand for the Coca leaves of South America has considerably increased for exportation. In the transit there has been a distinct loss in the alkaloids generally as well as in the Cocaine, and latterly it has been customary to extract the alkaloids from the leaves in South America and export a crude preparation to Europe and the States which is largely taken up by those who manufacture Cocaine. The demand therefore for Coca leaves has fallen off, and it is not likely that the growth of Coca leaves in our tropical colonies will ever assume any considerable proportions. South America alone is able to produce such an enormous quantity of Coca leaves that one per cent. of them would be more than enough to supply all the Cocaine markets in the world.

***

THE unusually cold weather experienced in England and Western Europe last October and November was also felt in Russia and Central Asia. The first fortnight in November was unusually cold in East and South Russia, colder than an average by 16—20 C. The rivers were covered with ice much earlier than usual. Two great waves of cold could be distinguished, both spreading from the north-west to the south-east. In the second part of November there was a sudden return of warm weather and the Russian rivers were opened again. Throughout this disturbed period the barometer gave valuable indications as to the movements of the cyclones and anti-cyclones. The high pressure reached 30·7 inches and moved with greater steadiness. The low pressure was about 28·4

***

DR. W. FREAM has just published the result of an important original investigation on the herbage of rye grass—practically upon the best way of producing a rich pasture; a most interesting subject to the farmer and land owner, since good grass land is easy to let even in these bad times. To plough up grass land has always been easy enough, but to convert tillage into good pasture is another and a harder problem. The result of the elaborate investigation is to justify the popularity with farmers of rye grass. Some years ago, a determined set was made against this grass. It was derided by a specialist and avoided by advanced agriculturists.

***

AT the Central Institution of the City Guilds, Professor Armstrong will give about ten lectures on some of the most important current problems in Chemistry, on Mondays at 4.30, commencing Jan. 21. The following subjects will be dealt with so far as time permits. The nature of chemical change, the interdependence of chemical change and electrolysis, molecular composition of gases, liquids and solids; nature of solution, physical constants, laws of substitution and isomeric change as bearing on the nature of chemical change, valency, geometrical, and alloisomerism.

Certificate Examination, 1888.

Male Candidates.

FIRST AND SECOND YEARS.

Geography.

(TWO *hours and a* HALF *allowed for this Paper.*)

Candidates may answer only THREE *of the first* FIVE, *and only* FOUR *other questions.*

Small sketch maps or diagrams may be drawn to illustrate any answer, at the candidate's discretion.

1. Explain why in the belt between the tropics the sun appears vertical in the sky twice in a year. Why does not an accurate clock always indicate twelve when the sun is on the meridian? Why are three of the leap years common years in each cycle of 400 years?

(1) (*a*) The sun shines vertically over the Tropic of Cancer on midsummer day. In six month's time the earth will have revolved half its course round the sun and will therefore be on the opposite side from that occupied in June. Now owing to the axis of the earth being inclined to the plane of its orbit 23½° and also because the axis maintains a constant direction, the Northern Hemisphere, which in June was inclined towards the sun, will in December be inclined away from the sun, and instead of the earth receiving direct and vertical rays over the Tropic of Cancer 23½° north of the Equator, those rays will now fall direct and vertical upon the Tropic of Capricorn 23½° south of the Equator. This change in the position of the vertical rays is a gradual one, and during the six months between midsummer and midwinter the sun shines directly over head once upon every portion of the belt between the tropics. During the six months between December and June the change explained above is repeated, only in a contrary direction, so that twice each year the sun's rays fall vertically over every portion of the Torrid zone, owing to the earth revolving round the sun with its axis inclined 23½° and maintaining a constant direction.

(*b*) An accurate clock is constructed to keep the same absolute interval of time between 12 o'clock on any one day and 12 o'clock the succeeding day. The Solar day, however, is constantly changing its duration for two reasons. (1) Because the earth's motion round the sun varies constantly from day to day owing to its perihelion and aphelion positions, and (2) Because the sun's apparent motion is not in a true east and west direction, but along the plane of the ecliptic; hence at the solstices its apparent movement eastward is greatest, at the equinoxes least, and between these two extremes the easterly movement is constantly varying.

(*c*) The earth completes its course round the sun in about 365¼ days. The civil year consists of 365 days. In order to correct for the loss of the ¼ of a day each year an extra day is added to the calendar every fourth year, *i.e.*, Leap year. This correction, however, still leaves an error inasmuch as the amount added is too much by 11 minutes 12 seconds each year. In order, therefore, to correct for this excess Pope Gregory ordered that every hundredth year should not be a Leap year, with this exception that every 400th year should be one.

2. How is rain formed? Why is the rainfall on the west of Great Britain greater than on the east? Explain why the country on the east of the Western Ghats receives comparatively little rain.

(2) Rain is formed by the condensation of the moisture in the atmosphere. The invisible vapour is first changed into visible, or into cloud, and then, by further condensation and the coalescing of the moisture particles, rain drops are formed. The west of Great Britain is favourably situated for considerable rainfall on account of the prevalent and very moist westerly winds. The winds are, however, forced up the mountain slopes, and are thus lowered in temperature; the vapour they contain is quickly condensed, forming large cloud masses, and yielding a heavy rainfall.

The district east of the Western Ghats is subject to two sets of winds, one from the south-west, another from the north-east. The south-west monsoon, after passing over the Western Ghats, has lost much of its moisture, and when it descends to the plateau on the east, instead of further condensation, the temperature is heightened, and the capacity for moisture increased, so that the wind, which has been a very moist wind on the western slopes of the Ghats, becomes a dry wind on the eastern side. The north-east monsoon blows for the most part over the land, and is therefore also a dry wind. Thus both the prevalent winds in this area are comparatively dry winds.

3. Explain the terms: constant winds, periodic winds, local winds, with examples. What are spring tides? At the port of Batsha the tidal wave comes in by two distinct channels, such that the time of arrival of the one is six hours later than of the other. How will the tide there be affected?

(3) **Constant Winds.**—These are winds which, like the trade winds in tropical regions, blow constantly over the Atlantic from Africa towards America, and from America across the Atlantic towards Asia.

Periodic Winds are those which, like the monsoons and land and sea breezes, change their direction regularly, either according to the season of the year or the time of the day.

Local Winds are such as blow with a certain amount of prevalence, and with such distinctive characteristics as to have a marked effect upon the climate of the district over which they blow, *e.g.*, the *Simoon* of the desert; the *Sirocco* of Southern Europe; the *Föhn* of the Alpine region; the *Mistral* of Southern France; and the *Harmattan* of Senegambia.

Spring Tides are the high tides which ordinarily occur once a fortnight shortly after the phase of new and full moons respectively.

In the case of the port mentioned, if only the first tide acted the water would be at low tide six hours after the high tide, but at this time the second tide is up, so that instead of the low tide a second high tide occurs. There would thus be no really low tide in the port at all, but two high tides every six hours, with a slight lowering of the tide level for about three hours, and then a gradual rise during the following three hours.

4. How is climate affected (1) by distance from the Equator, (2) by local influences? Why are the climates in the southern hemisphere distributed with much regularity according to latitude?

(4) (*a*) *Distance from Equator.*—At or near the Equator the rays of the sun shine vertically, whilst in high latitudes the sun's rays fall more or less obliquely, the amount of obliquity being dependent upon the distance north or south of the Equator. When two similar areas receiving the rays of the sun are compared as to the amount of heat received, it is found that the area upon which the rays fall directly receives much more heat than the area upon which the rays fall obliquely; further, not only do more heat rays proceed from the sun to the former area, but in consequence of the small thickness of the atmosphere through which these heat rays pass (as compared with the amount of atmosphere through which the oblique rays pass) there is far less absorption and reflection of the vertical or almost vertical heat rays than of those more oblique. Hence for these two reasons temperature is affected by latitude.

(*b*) *Local influences.*—**Proximity to the Sea** is one of these. On account of the high specific heat of water it changes in temperature very slowly, so that an insular climate is subject to much less variation of temperature than a neighbouring continental area in the same latitude.

Elevation is a second local condition. The air being warmed mainly by conduction and radiation from the heated land surface, a position on a mountain side is surrounded by air, which has not so much land surface to warm it as the air on the plain below. Besides this, the air is generally drier the higher we ascend, and this again lessens very greatly the power of the atmosphere to retain heat.

Local Winds affect the climate of a district, *e.g.*, the cold easterly winds of our spring may be compared with the warm and moist south-westerly winds of our summer and autumn.

Ocean Currents again carry warmth to definite localities, *e.g.*, the ports of Western and Northern Norway are open throughout the winter owing to the Gulf Stream and its continuation north-eastward. Nain, on the opposite shore of the Atlantic, in Labrador (near which the cold Arctic current passes), has one of the most severe climates known.

(*c*) *Climate in Southern Latitudes.*—In consequence of the land area being very limited in the southern hemisphere, and the water maintaining an almost constant temperature throughout the year, the climate is much more equable for given latitudes than is possible in the northern hemisphere, where, as we have seen above, many causes are at work to vary the climate over areas at the same latitude.

5. Give some account of the plants and animals found in Australia.

(5) **The Plant Life** of Australia is peculiar. In the first place nearly all the trees are evergreens; the change of seasons therefore has very little effect upon the appearance of the country. The larger growths are chiefly the *acacias* and the gum trees (*eucalypti*). No edible fruit-growing trees are indigenous, but most of the European varieties have been introduced, and with encouraging results. The greater number of species of plant life found in Australia belong to the cryptogamia, the tree ferns being the most striking example. Vegetation is not arranged in the usual zones in Australia, but the distribution follows the change of soil rather than change of latitude.

The **Animal Life** of Australia is more novel even than that of its plants. Of the entire species of animals only $\frac{1}{10}$th are common to those of other districts. All the quadrupeds, with the exception of the dog and rat, are peculiar to the continent, and most of them belong to the order termed *marsupials*, because they are provided with a pouch in which they carry their young after birth; the kangaroo is a well-known example.

Bird Life is less peculiar, but the emu (a kind of ostrich) is remarkable. Parrots abound, and a strange animal, with the body and fur of an otter and the bill of the duck (*the ornithorhynchus*), should be noted. **Reptiles** are neither numerous nor dangerous, except a species of crocodile, found along the northern and western coasts.

6. Name three places suitable for emigration, the principal advantages of each place, the kinds of employment an English settler would probably find at each, and the route by which he would travel to each from England.

(6) **New Zealand** is a suitable colony for English emigration, in the first place because of its temperate climate and its fertile soil; because, further, it has a settled Government with sound and just laws; it possesses also abundant space for further development. The most suitable persons are those who have some capital which they wish to invest in farming, and who have knowledge of the management of land and cattle, and who, above all, have robust health and industrious and thrifty habits. Such persons soon find employment, they quickly add to the land already under cultivation, and soon materially increase the wealth of the colony. The best way to travel for an English settler is to take his passage in a sailing vessel direct. He would in that case pass down the Channel across the Bay of Biscay, southwards along the African side of the Atlantic until the Trades were reached; then a course would be taken towards Rio, after passing which advantage would be taken of the return currents, and the N.W. return Trades, to sail towards Australia and thence to New Zealand.

Canada is a much older colony, and therefore presents much greater variety of employment. Labourers and skilled artisans readily find employment anywhere, whilst in the West in districts like Manitoba, recently opened out by the Canadian Pacific Railway, farmers with small capital thrive. Canada is reached by steamship direct from Liverpool across the Atlantic to Quebec, or may be reached by journey to New York, and thence to Ontario or Montreal by rail.

Cape Colony is a third district, well suited for emigration. The climate is excellent, the land fertile and abundant, and the Government settled and secure. Domestic servants, artisans and farm servants are the kind of people most in request. Sheep-farming and cattle rearing on the uplands is an extensive occupation. Here again land can be acquired for the money which in England would only rent it, and small capitalists who have skill and experience may soon become wealthy members of the colony. Cape Colony is reached by steamship direct from London in about three weeks, the course being from London to Dartmouth, to the Madeiras, and thence direct to Cape Town Port Elizabeth.

7. From what British possessions (or colonies) do we obtain maize, quinine, rice, diamonds, hides, jute, ostrich feathers, teak, and wool.

(7)

Maize is obtained from		Cape Colony, Natal, Australia, and the West Indies.
Quinine	,, ,,	The Neilgherry District (India).
Rice	,, ,,	India, Singapore, Malacca, Brit. Guiana, W. Indies.
Diamonds	,, ,,	Cape Colony and Natal.
Hides	,, ,,	India, Cape Colony, Natal, Australia, New Zealand, Falkland Islands, Western Africa.
Jute	,, ,,	India.
Ostrich feathers	,,	Cape Colony and Natal.
Teak	,, ,,	India.
Wool	,, ,,	India, Cape Colony, Natal, Australia, New Zealand, Tasmania.

8. Describe the course of the Indus, or the St. Lawrence; naming the chief towns and tributaries; and stating the character of the adjacent country.

(8) The St. Lawrence is the chief river in the Dominion. It rises in the St. Louis, a small stream entering the western extremity of Lake Superior, The Great Lakes form the most striking feature in the upper basin of the river. Lake Superior is the largest of these, and is united by a narrow channel to Lake Huron. In Huron also flows the water of Lake Michigan. The shores of these lakes, with the exception of the southern portions of Huron and Michigan, are bleak and uninteresting, and are only valuable for the copper mines along them. The southern shores are much more fertile, and Chicago, on Michigan, and Goderich, Collingwood, and Sarnia, on Huron, are rapidly rising and important towns. The river and Lake St. Clair, into which flow the Thames and the River Detroit unite Huron with Lake Erie. This lake is in the midst of fertile surroundings, and has the large towns of Ports Stanley, Dover, Colborne, Buffalo, and Cleveland standing upon its banks. Between Lakes Erie and Ontario are the famous Falls of Niagara. The peninsula between the Georgian Bay in Lake Huron and the Lake of Ontario is the most fertile, and is rapidly becoming the most densely peopled of the entire Dominion. The chief towns of this district are Hamilton, Toronto, Cobourg, Kingston and Belleville. After leaving Ontario the river takes the name of the St. Lawrence. The River Ottawa is the chief tributary on the left bank. On it stands Ottawa, the capital of the Dominion, and near where the river enters the St. Lawrence stands Montreal, one of the finest towns and ports in the New World. The St. Maurice and the Saguenay are other tributaries on the right bank. Three Rivers is an important town at the mouth of the St. Maurice. Quebec, the old capital, is an important port and fortress. The river here is two miles in width. The rivers entering on the American side are the Richelieu, the St. Francis, and the Chandiere; all these flow in a thickly wooded and sometimes mountainous district, with intervening plains very fertile and well cultivated.

9. Give notes of a lesson to an upper class on the physical features, climate, chief towns, and industries of South Island (New Zealand).

(9)

INFORMATION.	HOW TAUGHT.
A Physical Features.	
1. Mountains.	
(*a*) A well-defined mountain ridge runs from the N.W. along the western coast, from Cape Farewell to West Cape in the south.	Prepare a sand model and a sketch map of the coast line only.
(*b*) *Peaks, &c.—In the north* the range is named after Tasman, with the summits of Snowdon, Peel and Arthur.	Show the position of each portion of the range, and as each is indicated on the model put in the position on the sketch map.
In Nelson Province the range is called Spenser range, with Franklin as the highest point. *In the South* the range becomes divided into several parallel ranges, with Mount Odin and Kaitarau as the chief peaks.	Write down the names in full and connect them with the discoverers whose names they bear. If native, the names need to be written very distinctly, so that their spelling may be remembered.
2. Plains, Valleys and Rivers:	
Running from the main ridge in the west are several spurs and minor hill ranges, which give an undulating character to the central and eastern districts. Through the valleys thus formed the chief rivers of the island flow. These are Wairau, Clarence, Grey and Buller in the north; Hurunui, Selwyn, and Waitaki in the centre; and the Clutha and Waiau in the south.	These ridges should be taught first from the model. The valleys follow the hill ranges and should be associated with the hills on either side, and the rivers in their midst. The names of these rivers should be written out in full, and their places indicated on both map and model.
B. Climate:	
(*a*) *Latitude.*—The same as S. Europe, hence warmer than England.	This comparison requires the reference to a map of Europe.
(*b*) *Proximity of Sea.*—On this account subject to fewer changes of temperature with sufficient moisture to assist vegetation.	The sea shores along the south of Europe in winter may be compared to those of New Zealand; but the heat of summer is not nearly so
(*c*) *Elevation.*—No great heights to chill the breezes by their snowy slopes. A beautiful climate, in every way agreeable to Englishmen.	great as in the South of France. Show this by stating that the climate of London is 3° colder than in South Island.
C. Industries:	
The prime occupation is that of agriculture. *Pasturage* with flocks of sheep. *Tillage* with corn, maize, barley and potatoes. Mining of gold in Nelson and Marlborough.	Teach by the necessity of Colonies first to obtain food. Then to supply others in order to obtain wealth.
D. Towns:	
Nelson, on Tasman Bay; Blenheim, near Cloudy Bay; Christchurch, near Pegasus Bay; Dunedin, on Otago Harbour; Hokitika, in Westland; Invercargill, in Southland.	Besides the association of town with bay, the size and trade of each town might be added.

10. Give the position, as nearly as you can, of the following places, and mention any notable facts concerning them:—Adelaide, Aden, Balmoral, Colombo, Georgetown, Kingstown, Kingston, Limerick, Montreal, New Westminster, Plymouth.

(10)

1. **Adelaide**, on the River Torrens Port Adelaide, its port, is seven miles distant. It is the capital of South Australia, and has a population of about 50,000.

2. **Aden**, near the entrance of the Red Sea. It is a fortified port, and a coaling depôt on the overland route.

3. **Balmoral**, on the River Dee, in Aberdeen, is the Highland residence of the Queen.

4. **Colombo**, in the S.W. of Ceylon, is the capital of the colony.

5. **Georgetown**, on the coast, is the chief town in British Guiana.

6. **Kingston**, at the mouth of the Cobre, is the capital of Jamaica.

7. **Limerick**, on the Shannon, the chief seaport on the S.W. of Ireland.

8. **Montreal**, on the St. Lawrence, the largest and most commercial city in Canada.

9. **New Westminster**, on the Fraser River, a town in British Columbia.

10. **Plymouth**, on Plymouth Sound, the largest port in the S.W. of England, with a naval dockyard and a splendid harbour.

11. Describe Cape Colony, referring briefly to each of the following points:—When discovered and how then named—boundaries—capes and bays—mountains—climate—minerals—chief rural industry—animals.

(11)

1. **Discovery.**—The Cape of Good Hope was discovered by a Portuguese named Bartholomew Diaz, 1486, who first named it *The Cape of Storms.*

2. **Boundaries.**—W., by the Atlantic Ocean.
S.E., by the Indian Ocean.
N., by the Orange River, from its mouth to Griqualand; the boundary includes the latter district; from thence eastward south of the Orange Free State, and along to Drakenfeld to near Delagoa Bay.

3. **Capes and Bays.**—Table Bay, Cape of Good Hope, with Simon's Bay. These were the regions first colonised; eastward is Cape Agulhas, the most southern point in Africa; Algoa Bay, with Port Elizabeth near, is the most important seaport in the S.E.

4. **Mountains.**—The mountain ranges in Cape Colony follow very regularly the line of coast.
1. The Nieu-we-veld mountains form the southern limit of the Orange River basin. They are continued eastward by the Storm Berg and the Drakenberg Mountains.
2. The Zwarte Mountains form a parallel range to the south of the Nieu-we-veld. The district between the two ranges is called the Great Karroo.
3. Nearer the coast are the Swellendam Mountains.

5. **Climate.**—The climate of Cape Colony is healthy. It is drier than that the English climate. At times there is liability to drought.

6. **Minerals.**—**Copper** in the north-west is mined extensively. **Diamonds** are found in the north. **Gold** in Namagualand.

7. **Rural Industries.**—Cattle and sheep-rearing, breeding of horses and ostriches. Cultivation of ordinary cereals, the vine, and some cotton and tobacco.

8. **Animals.**—The wild animals are—**Elephants, Tigers, Lions, Hyænas, Leopards,** and **Antelopes.**
The ordinary *domestic cattle* are abundant.
The keeping and rearing of **Ostriches** is an important industry. The **Silkworm** has been introduced.

Male Candidates.

FIRST YEAR.

Mental Arithmetic.

(Twenty minutes allowed for this paper.)

You are to enter the answer in the space (——) left for it after each question. Nothing is to be written on this paper except the particulars required and the answers (which must be written in ink only) to the questions. *No erasures or alterations are permitted.* They will be marked as errors.

1. ·1875 × 17s. 4d. reduced to the fraction of 19s. 6d. = (——).

$$= \frac{3}{16} \times \frac{\overset{13}{208}}{\underset{78}{234}} = \frac{1}{6}. \text{ Ans.}$$

2. The length cut off a board $5\frac{1}{2}$ feet long, 17 inches wide, so that area of part remaining is $4\frac{1}{4}$ square feet = (——).

$$= 5\tfrac{1}{2} \text{ ft.} - (4\tfrac{1}{4} \div 1\tfrac{7}{12}) \text{ ft.} = 5\tfrac{1}{2} \text{ ft.} - \left(\frac{17}{4} \times \frac{\overset{3}{12}}{17}\right) \text{ ft.}$$
$$= \underline{2\tfrac{1}{2} \text{ ft.}} \text{ Ans.}$$

3. $\frac{3\frac{3}{4} + 2\frac{3}{4}}{3\frac{3}{4} - 2\frac{3}{4}}$ in simplest form = (——).

$$= \frac{\frac{15}{4} + \frac{11}{4}}{\frac{15}{4} - \frac{11}{4}} = \frac{68 + 55}{68 - 55} = \frac{123}{13}$$
$$= \underline{9\tfrac{6}{13}}. \text{ Ans.}$$

4. Discount on £393 15s. due 5 years hence at $2\frac{1}{2}$ per cent. per annum simple interest = (——).

$$= \frac{2\frac{1}{2} \times 5}{100 + 2\frac{1}{2} \times 5} \text{ or } \frac{12\frac{1}{2}}{112\frac{1}{2}} \text{ or } \frac{25}{225}$$
or $\frac{1}{9}$ of £393 15s. = $\underline{\text{£43 15s.}}$ Ans.

5. If $(17^2 - 16^2) + 99 - 23 + 26 = x$;
then $\frac{x}{10} - \frac{1}{3} =$ (——).

$x = (17 + 16) \div 99 = \frac{1}{3} - 23 + 26 = 3\frac{1}{3}$;
then $3\frac{1}{3} \div 10 = \frac{1}{3} - \frac{1}{3} = \underline{0}$. Ans.

6. $1053x$ is a perfect square; least value of x = (——).
$= 9 \times 117x = 9 \times 9 \times 13x = \underline{13}$. Ans.

7. A can do a work in 4, B in 5 days. After working together one day, B leaves. Time in which A will finish it = (——).

$$= [1 - (\tfrac{1}{4} + \tfrac{1}{5})] \div \tfrac{1}{4} = \frac{11}{20} \times \frac{\overset{1}{4}}{1}$$
$$= \underline{2\tfrac{1}{5} \text{ days.}} \text{ Ans.}$$

8. 690 things at 19s. 4d. = (——).

$$= \text{£690} - \frac{8}{240} \text{ of £690}$$
$$= \text{£690} - \text{£23} = \underline{\text{£667}}. \text{ Ans.}$$

9. Fourth proportional to 143, 273, 187 = (——).

$$= \frac{\overset{21}{273} \times \overset{17}{187}}{\underset{13}{143}} = \underline{357}. \text{ Ans.}$$

or = 11 : 21 :: 187 : 4th term.
= 21 × 17 = 357.

10. By selling a carriage for £46 16s., a man gained one-fifth of cost price. If he had sold it for £52, gain per cent. on cost price = (——).

Cost price = £46 16s. × $\frac{5}{4}$
= £234 ÷ 6 = £39;
Gain per cent. = (£52 − £39) × $\frac{100}{39}$
= 13 × $\frac{100}{39}$
= 100 ÷ 3 = $\underline{33\frac{1}{3}}$. Ans.

11. 4 cwt. 1 qr. 16 lbs. at £4 13s. 4d. per qr. = (——).

$$= \text{£}4\tfrac{3}{4} \times 17\tfrac{1}{4} = \left(\frac{\overset{2}{19}}{3} \times \frac{\overset{41}{123}}{\underset{1}{4}}\right) \text{£}$$
$$= \underline{\text{£82.}} \text{ Ans.}$$

12. Income from investment of £833 5s. in Three per Cents. at 101 = (——).

$$= \text{£833 5s.} \times \frac{3}{101}$$
$$= \text{£8 5s.} \times 3 = \underline{\text{£24 15s.}} \text{ Ans.}$$

13. Simple interest on £9,601 for 3 years at $2\frac{1}{2}$ per cent. per annum = (——).

$2\frac{1}{2}\% \times 3 = 7\frac{1}{2}\% = 5\% + 2\frac{1}{2}\% = \frac{1}{20} + \frac{1}{40}$
$= \frac{1}{20}$ of £9,601 + $\frac{1}{2}$ of $\frac{1}{20}$ of £9,601
= £480 1s. + £240 0s. 6d.
= $\underline{\text{£720 1s. 6d.}}$ Ans.

14. £31 12s. was divided amongst 3 persons in the proportion of $\frac{2}{3}$, $\frac{1}{5}$, $\frac{3}{4}$; the smallest share = (——).

$$\tfrac{2}{3} + \tfrac{1}{5} + \tfrac{3}{4} = \frac{24 + 10 + 45}{60} = \frac{79}{60}$$
$$= \text{£31 12s.} \times \tfrac{1}{79} = \text{£316} \div 79 = \underline{\text{£4.}} \text{ Ans.}$$

ALTERNATIVE PAPER.

1. 648 things at 19s. 2d. = (——).

$= £648 - \frac{19}{240}$ of £648

$= £648 - £27 = \underline{£621}$. Ans.

2. £13 6s. was divided amongst 3 persons in the proportion of $\frac{1}{2}, \frac{3}{4}, \frac{4}{5}$; the largest share = (——).

$\frac{1}{2} + \frac{3}{4} + \frac{4}{5} = \frac{40 + 45 + 48}{60} = \frac{133}{60}$

$= £13\ 6s. \times \frac{48}{133} = 2s. \times 48 = \underline{£4\ 16s.}$ Ans.

3. Simple interest on £8,001 for 4 years at $1\frac{1}{2}$ per cent. per annum = (——).

$1\frac{1}{2}\% \times 4 = 4\frac{1}{2}\% = \frac{2}{300} = \frac{1}{150}$ of £8,001

$= £2,667 \div 5 = \underline{£533\ 8s.}$ Ans.

4. By selling carriage for £27 4s. a man lost one-fifth of cost price. If he had sold it for £51, gain per cent. on cost price = (——).

Cost price = £27 4s. $\times \frac{5}{4}$

$= £136 \div 4 = £34$;

Gain per cent. $= (£51 - £34) \times \frac{100}{34}$

$= 17 \times \frac{100}{34}$

$= \underline{50}$. Ans.

5. 4 cwt. 2 qrs. 16 lbs. at £5 5s. per qr. = (——).

$= £5\frac{1}{4} \times 18\frac{1}{2} = \left(\frac{\overset{3}{21}}{\underset{2}{4}} \times \frac{\overset{65}{130}}{\underset{2}{1}}\right) £$

$= £\frac{195}{4} = \underline{£97\ 10s.}$ Ans.

6. Income from investment of £726 15s. in Three per Cents. 102 = (——).

$= £726\ 15s. \times \frac{3}{102}$

$= £7\ 2s.\ 6d. \times 3$

$= \underline{£21\ 7s.\ 6d.}$ Ans.

7. If $(19^2 - 18^2) \div 74 - 19 + 23 = x$:

then $\frac{x}{9} + \frac{1}{2} =$ (——).

$x = (19 + 18) \div 74 = \frac{1}{2} - 19 + 23 = 4\frac{1}{2}$; then $4\frac{1}{2} \div 9 = \frac{1}{2} + \frac{1}{2} = \underline{1}$. Ans.

1. Fourth proportional to 126, 351, 154 = (——).

$= \frac{\overset{39}{351} \times \overset{11}{154}}{\underset{2}{126}} = \underline{429}$. Ans.

or = 14 : 39 :: 154 : 4th term.

$= 39 \times 11 = 429$.

9. ·3125 of £1 1s. 4d. reduced to the fraction of £1 3s. 4d. = (——).

$= \frac{5}{16} \times \frac{\overset{2}{64}}{\underset{4}{20}} = \underline{\frac{2}{3}}$. Ans.

10. A can do a work in 3, B in 4 days; after working together 1 day B leaves. Time in which A will finish it = (——).

$= [1 - (\frac{1}{3} + \frac{1}{4})] \div \frac{1}{3}$

$= \frac{5}{12} \times \frac{3}{1} = \underline{1\frac{1}{4}}$ days. Ans.

11. $833x$ is a perfect square; least value of x = (——).

$= 49 \times 17x = \underline{17}$. Ans.

12. The length cut off a board $5\frac{1}{2}$ feet long, 19 inches wide, so that area of part remaining is $4\frac{3}{4}$ sq. feet = (——).

$= 5\frac{1}{2}$ ft. $- (4\frac{3}{4} \div 1\frac{7}{12})$ ft.

$= 5\frac{1}{2}$ ft. $- \left(\frac{19}{4} \times \frac{\overset{3}{12}}{19}\right)$ ft. $= \underline{2\frac{1}{2}}$ ft. Ans.

13. Discount on £386 11s. due $2\frac{1}{2}$ years hence at 5 per cent. per annum simple interest = (——).

$= \frac{2\frac{1}{2} \times 5}{100 + 2\frac{1}{2} \times 5}$ or $\frac{12\frac{1}{2}}{112\frac{1}{2}}$ or $\frac{25}{225}$

or $\frac{1}{9}$ of £386 11s. = £42 19s. Ans.

14. $\frac{4\frac{1}{4} + 3\frac{1}{8}}{4\frac{1}{4} - 3\frac{1}{8}}$ in simplest form = (——).

$= \frac{\frac{17}{4} + \frac{13}{8}}{\frac{17}{4} - \frac{13}{8}} = \frac{85 + 76}{85 - 76} = 18\frac{1}{9}$

$= \underline{17\frac{1}{9}}$. Ans.

Male Candidates.

FIRST YEAR.

Arithmetic.

(TWO hours and a HALF allowed for this paper.)

Candidates are not permitted to answer more than TEN questions, and are advised to answer the first.

The solution must be given at such length as to be intelligible to the examiner, otherwise the answer will be considered of no value.

1. (*a*) Employ short division in dividing 4103 by 105, taking the factors 3, 5, 7, and explain clearly your method of obtaining the remainder.

(*b*) Show that the rule for extracting cube root in arithmetic is based on the algebraical method. Find the cube root of 493039 to illustrate your remarks.

(*c*) Define *prime numbers, proportion, average, par of exchange, discount,* with examples.

(*d*) Give rules for mental solutions in the following cases:—(1) to multiply by 625; (2) the price of any number of things at 2s. 1d. each; (3) simple interest at $6\frac{1}{4}$ per cent. per annum; (4) difference of squares of two consecutive numbers.

(*a*)

$$105\left\{\begin{array}{l|l} 3 & 4103 \\ 5 & 1367..2 \\ 7 & 273...2 \\ & 39 \end{array}\right\} 3 \times 2 + 2 = 8$$

Quotient = 39 and 8 remainder. Reason for obtaining the remainder. After dividing the given number by 3, we obtain 1367 threes, and a remainder of 2 units.

We now divide 1367 threes by 5, and obtain 273 fifteens and a remainder of 2 threes or 6 units, and this added to the former remainder of 2 units, gives a remainder of 8.

As there is no remainder from dividing 273 fifteens by 7, the total remainder is 8.

(*b*) $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$;

$a^3 + 3a^2b + 3ab^2 + b^3\ (a + b$

a^3

$3a + b$ | $3a^2$ | $3a^2b + 3ab^2 + b^2$

$+ (3a + b)b$ | $3a^2b + 3ab^2 + b^2$

$3a^2 + 3ab + b^2$

493039 (70 + 9

343000 = 79

150039

$210 + 9 \quad 14700$

$= 219 \times 9 = 1971$

16671 | 150039

The ciphers may be omitted for brevity, and the process will stand thus:—

493039 (79

343

150039

$219 \quad 147$

$\times 9 = 1971$

16671 | 150039

(*c*) A prime number has no factors but itself and unity. Thus, 7, 19, 23 are prime numbers.

When the measure of one ratio is equal to the measure of another ratio, the four quantities are said to be in proportion. Thus, the measures of the ratios 4 to 9 and 8 to 18 are both of them $\frac{4}{9}$, therefore the four quantities 4, 9, 8, and 18 are said to be in proportion.

The average or mean of any number of given quantities of the same kind is that quantity, which when put in place of each of the given quantities makes their sum the same. Hence, to find the average of any number of quantities, we divide the sum of them by their number.

Thus, the average of 3, 7, and 8 = 3 + 7 + 8 + 3 = 18 ÷ 3 = 6.

The relation between the standard coins of two countries, as determined from their intrinsic value, is called the nominal rate of exchange, or par of exchange.

If payment of a sum of money, due in France, be made by sending specie there, we must ascertain how many francs will be given for a sovereign at the French mint; and this is deduced by making a comparison between the weight and fineness of the metals composing the sovereign and the standard coin of France. The result is found to be 25·17 francs, and is called the par of exchange between the two countries.

Discount is the abatement made when a sum of money is paid before it is due, and is the interest of the present worth for the given time at the given rate.

Thus the discount on £105 due 1 year hence at 5 per cent. is £5, for it is the interest on £100 (present worth).

(*d*)—(1) $625 = \frac{10000}{16}$.

Rule.—Add 0000, and divide by 16.

(2) 2s. 1d. = $£\frac{21}{120} = £\frac{7}{40} = £\frac{1}{5\frac{5}{7}}$.

Rule.—Add 0, and divide by 96; answer in pounds.

(3) $6\frac{2}{3}$ per cent. = $£\frac{6\frac{2}{3}}{100} = £\frac{20}{300} = £\frac{1}{15}$.

Rule.—Take $\frac{1}{15}$ of the principal.

(4)
$$\begin{aligned}&(a+1)^2 - a^2\\ &= a^2 + 2a + 1 - a^2\\ &= 2a + 1\\ &= (a+1) + a.\end{aligned}$$

Rule.—Find the sum of the two numbers.

2. A mètre is 39·3708 inches: find to three places of decimals the number of acres in a hectare, which is 10,000 square mètres.

$$\text{No. of acres} = \frac{39{\cdot}3708 \times 39{\cdot}3708 \times 10000}{144 \times 9 \times 4840}$$
$$= 39{\cdot}3708 \times 39{\cdot}3708 \times \frac{250}{121}$$

```
  39·3708
  39·3708
 295281
2624720
  65618
  98427
1549·76430481
            250
1089)387441·0762025(355·7
     3267
      5774
      5445
       3290
       3267
         230
```

$= 355{\cdot}7$....Ans.

3. The rainfall of 1 inch per sq. yd. weighs $46\frac{3}{4}$ lbs.: determine (to two places of decimals) the error in the statement that per acre it weighs 100 tons.

$$\text{Rainfall per acre} = (46\tfrac{3}{4} \times 4840) \text{ lbs.}$$
$$= \frac{187 \times 1210}{2240} \text{ tons}$$
$$= \frac{22627}{244} \text{ tons}$$
$$= 101{\cdot}01\text{...tons;}$$
$$\therefore \text{ Error} = 1{\cdot}01\text{...tons too little. Ans.}$$

4. Simplify $3\frac{7}{15}$ of $\frac{2\frac{2}{3}}{4\frac{4}{7}} \div 7\frac{1}{7} + 2\frac{3}{10}$ of $\frac{3}{5\frac{5}{8}}$ of $\frac{5}{4\frac{4}{7}} - \frac{7}{10\frac{1}{2}}$ of $1\frac{1}{14}$.

$3\frac{7}{15}$ of $\frac{2\frac{2}{3}}{4\frac{4}{7}} \div 7\frac{1}{7} + 2\frac{3}{10}$ of $\frac{3}{5\frac{5}{8}}$ of $\frac{5}{4\frac{4}{7}} - \frac{7}{10\frac{1}{2}}$ of $1\frac{1}{14}$

$$= \frac{\overset{4}{52}}{\underset{3}{15}} \times \frac{\overset{8}{32}}{\underset{7}{32}} \times \frac{1}{\underset{1}{7}} + \frac{\overset{11}{33}}{\underset{2}{70}} \times \frac{3}{\underset{13}{65}} \times \frac{5}{\underset{4}{24}} - \frac{7}{\underset{2}{21}} \times \frac{\overset{5}{15}}{\underset{12}{14}}$$
$$= \tfrac{1}{21} + \tfrac{3}{130} - \tfrac{1}{24}$$
$$= \frac{40 + 9 - 35}{840}$$
$$= \tfrac{1}{210}$$
$$= \tfrac{1}{2\frac{1}{2}}. \text{ Ans.}$$

5. Find the value of $\frac{18{\cdot}7}{{\cdot}204}$ of £2 12s. $- \frac{{\cdot}94}{{\cdot}083}$ of £16 12s.; and express the result as a decimal of £890.

$$\text{Value} = \frac{18{\cdot}7}{{\cdot}204} \text{ of £2 12s.} - \frac{{\cdot}94}{{\cdot}083} \text{ of £16 12s.}$$
$$= \left(\frac{\overset{275}{187}}{\underset{3}{204}} \times \frac{52}{1} - \frac{83}{\underset{1}{99}} \times \frac{\overset{1008}{1008}}{\underset{1}{83}} \times \frac{332}{1}\right) \text{s.}$$
$$= \left(\frac{14300}{3} - \frac{33200}{9}\right) \text{s.}$$
$$= \frac{42900 - 33200}{9} \text{s.}$$
$$= \frac{9700}{9} \text{s.;}$$
$$\text{Fraction} = \frac{\overset{97}{9700}}{9} \times \frac{1}{\underset{2}{892} \times \underset{2}{20}}$$
$$= \frac{97.}{1602}$$

```
Decimal = 1602) 97·00 (·060549
              9612
               8800
               8010
                7900
                6408
                14920
                14418
                  502
```

$= {\cdot}060549$...Ans.

6. Forty-two pounds of Assam tea are mixed with twenty-four pounds of Darjeeling tea; how much Assam must be added in order that, in the new mixture, for every 17 lbs. Assam there may be 9 lbs. Darjeeling?

9 lbs. Darjeeling require 17 lbs. Assam,

24 ,, ,, ,, $\frac{17 \times \overset{8}{24}}{\underset{3}{9}}$ lbs. Assam,

$= 14\frac{2}{3}$ lbs. Assam,

$\therefore$ Quantity of Assam to be added = $(45\frac{1}{2} - 42)$ lbs.

$= 3\frac{1}{2}$ lbs. Ans.

7. A and B can do a piece of work separately in 12 and 16 days respectively; they work together at it for 3 days, when A leaves, but B continues, and after 2 days is joined by C, and they finish it together in 3 days. In what time would C do it alone?

Part done by C in 3 days = $1 - (\frac{1}{12} \times 3 + \frac{1}{16} \times 8)$

$= 1 - (\frac{1}{4} + \frac{1}{2})$

$= \frac{1}{4}$,

Part done by C in 1 day = $\frac{1}{12}$,

$\therefore$ C could do the work alone in 12 days. Ans.

8. At a game of skill A can give B 20 in 100, B can give C 15 in 100. How many can A give C?

A can get 100 while B gets 80,

B ,, ,, ,, C ,, 85,

B ,, 80 ,, C ,, $\frac{\overset{17}{85} \times \overset{4}{80}}{\underset{2}{100}}$

$= 68$,

A can get 100 while C gets 68,

$\therefore$ A can give C 32 in 100. Ans.

9. Find the square root of $7\frac{2}{11}\frac{3}{13}\frac{3}{13}$.

$$7\tfrac{2}{11}\tfrac{3}{13}\tfrac{3}{13} = \frac{88209 \times 7 + 79762}{88209} = 8\tfrac{1}{11}\tfrac{3}{13}\tfrac{3}{13};$$

$$\begin{array}{r|l} 6\,\overline{72}\,25 & 835 \\ 64 & \\ \hline 163 & 572 \\ & 489 \\ \hline 1665 & 8325 \\ & 8325 \end{array} \qquad \begin{array}{r|l} 88\,\overline{20}\,9 & 297 \\ 4 & \\ \hline 49 & 482 \\ & 441 \\ \hline 587 & 4109 \\ & 4109 \end{array}$$

$\therefore$ Square root $= 8\frac{3}{13}$
$= 2\frac{11}{13}$. Ans.

10. A man stakes his property in four successive ventures. In the first he loses 40 per cent.; in each of the others he gains 20 per cent. What percentage of profit remains on his outlay?

	100
	40
	60
20 % $= \frac{1}{5}$	12
	72
$\frac{1}{5}$	14·4
	86·4
$\frac{1}{5}$	17·28
	103·68

$\therefore$ Percentage of profit $= 3{\cdot}68$.
$= 3\frac{17}{25}$. Ans.

11. Find the simple interest on £466 13s. 4d. for 6 years at 4 per cent. per annum, and the discount on £578 13s. 4d., due 6 years hence at 4 per cent. per annum. Why are the two results identical?

£	s.	d.	
466	13	4	
		6	
2800	0	0	
		4	
£112·00			

$\therefore$ Interest $=$ £112.

£	£	s.	d.	£	
124	: 578	13	4	:: 24	: Discount.
31		6	6		
	3472	0	0		
	£112				

$\therefore$ Discount $=$ £112.

Note.—The two results are identical, as (£578 13s. 4d. − £112) or £466 13s. 4d. is the present worth of £578 13s. 4d., and the discount is the interest on the present worth.

12. What sum of money will amount to £13,022 2s. in three years at compound interest, the interest for the 1st, 2nd, and 3rd years being 6, 5, 4 per cent. respectively?

£		
106		
5·3		
111·3		
4·452		
115·752	: 13,022·1	:: 100 : Principal.

£

$= 115752)1302210000(11,250$

115752
144690
115752
289380
231504
578760
578760

$\therefore$ Sum $=$ £11,250. Ans.

13. A man sells £39,300 four per cent. stock at 132, and invests the proceeds in stock, paying $2\frac{3}{4}$ per cent., whereby his income was diminished by £120 per annum; find the price he paid for the latter stock. (Neglect brokerage.)

Income in 1st case $= 4\%$ on £39,300
$=$ £1,572;
„ 2nd „ $=$ £1,572 − £120
$=$ £1,452;
Stock in 2nd case $=$ £1,452 $\times \frac{100}{2\frac{3}{4}}$
$=$ £1,452 $\times \frac{400}{11}$
$=$ £132 $\times$ 400
$=$ £52,800;

$\therefore$ Price of stock in 2nd case $=$ 132 $\times \frac{39300}{52800}$
$= 98\frac{1}{4}$. Ans.

Female Candidates.

FIRST YEAR.

Arithmetic.

(TWO *hours and a* HALF *allowed for this Paper.*)

No Candidate is permitted to answer more than TEN *questions.*

The *solution* must be given at such length as to make the method of working intelligible to the Examiner, otherwise the answer will be considered of no value.

1. Our 19,332 miles of railways earned in one year £66,615,377. Find (in pounds only) the receipts per mile. How would you show Standard III. children the approximate answer to be expected to such a problem? Illustrate your answer.

£ £
$19{,}332)66{,}615{,}377(3{,}445$

57996
86193
77328
88657
77328
113297
96660
16637

The remainder is 16 thousand and the divisor is 19 thousand, so that it would go nearly 6 times instead of 5 times, that is, if the amount were 3 thousand pounds more the quotient would be one more.

$\therefore$ The approximate answer is £3,446.

2. In working a proportion sum by the method of unity, the logical method is first to perform the division, and afterward the multiplication. But in practice it is often more convenient to multiply first and then divide. Take the following problem, find the result by both methods, and explain as to a class of children which method you would prefer, and why:—

If 17 articles cost 3s. 6d., what will 265 articles cost?

If 17 articles cost 3s. 6d.,
1 article costs $\frac{3\text{s. }6\text{d.}}{17}$,

$\therefore$ 265 articles would cost $\frac{3\text{s. }6\text{d.} \times 265}{17}$;

First method $= (3\text{s. }6\text{d.} \div 17) \times 265$
$= (42\text{d.} \div 17) \times 265$
$= 2\frac{8}{17}\text{d.} \times 265$
$= (265 \times 2)\text{d.} + \frac{265 \times 8}{17}\text{d.}$
$= 530\text{d.} + 2\frac{10}{17}\text{d.}$
$= 530\text{d.} + 124\frac{12}{17}\text{d.}$
$= 654\frac{12}{17}\text{d.}$
$= 54\text{s. }6\frac{12}{17}\text{d.}$
$=$ £2 14s. $6\frac{12}{17}$d. Ans.

Second Method = (3s. 6d. × 265) ÷ 17
= (795s. + 132½s.) ÷ 17
= 927s. 6d. ÷ 17
= 54s. 6½d.
= £2 14s. 6½d. Ans.

Note.—When the division can be performed exactly, the first method is more convenient. But when (as in this case) there is a remainder, the second method is preferable, as the multiplication of a fraction is avoided.

3. In a mixed school with 400 names on the rolls, the boys made 69,435 attendances and the girls 65,783 at 419 openings of the school; find—

(*a*) The average attendance of each sex; and

(*b*) The average number of attendances made by each child.

(*a*)

419)69,435(165·7
419
2753
2514
2395
2095
3000
2933
67

419)65,783(157
419
2388
2095
2933
2933

Average attendance of boys = 165·7
,, ,, ,, girls = 157 } Ans.

(*b*)

69,435
65,783
4,00 | 1352,18 = Total attendances.
338·045 = Average number of attendances made by each child.

4. Express as the fraction of a ton:
⅔ of ¾ of a cwt. + ⅘ of 15 cwt. 3 qrs. − 3 cwt. 2 qrs. 14 lbs.

Fraction
$$= \frac{\frac{2}{5}\text{ of }\frac{3}{4}\text{ cwt.} + \frac{8}{20}\text{ of 15 cwt. 3 qrs.} - 3\text{ cwt. 2 qrs. 14 lbs.}}{1\text{ ton.}}$$
$$= \frac{\left(\frac{2}{5}\times\frac{3}{4}\times\frac{4}{1}+\frac{9}{20}\times\frac{63}{1}-14\frac{1}{2}\right)\text{ qrs.}}{80\text{ qrs.}}$$
$$= \frac{\frac{3}{5}+\frac{567}{20}-\frac{29}{2}}{80}$$
$$= \frac{24+567-290}{80\times 20}$$
$$= \frac{301}{1600}.\quad \text{Ans.}$$

5. Find the cost of paper 27 inches wide for a room 14 ft. 6 in. by 12 ft. 6 ins., and 8 ft. in height from skirting board to cornice, at 9d. per piece of 12 yards, allowing a foot for waste to match the pattern in every length cut.

Perimeter of room = (14½ + 12½) ft. × 2
= 27 ft. × 2
= 54 ft.;

No. of lengths of paper required = 54 ft. ÷ 27 in.
$$= \frac{2}{54}\times\frac{12}{27}$$
= 24;

Quantity of paper required = (24 × 9) ft.
= 72 yds.;

∴ Cost of paper = [(72 ÷ 12) × 9]d.
= 54d.
= 4s. 6d. Ans.

6. Two boys earn each one-fifth of their father's wages, their three sisters earn each one-sixth of his wages, and their mother earns half as much as each of her boys. The total earnings of the family for 52 weeks amount to £104. Find the weekly earnings of each member.

Weekly earnings of family = £104 ÷ 52 = £2;
Father's wages × (1 + ⅕ × 2 + ⅙ × 3 + ½) = £2,
,, ,, × (1 + ⅖ + ½ + ½) = £2,
,, ,, × $\frac{10+4+5+1}{10}$ = £2,
,, ,, × $\frac{20}{10}$ = £2,
,, ,, = £2 ÷ 2 = £1;
Each son's wages = ⅕ of £1 = 4s.;
Each daughter's wages = ⅙ of £1 = 3s. 4d.;
Mother's wages = ½ of 4s. = 2s.

7. How many revolutions in a minute will be made by a carriage-wheel 4·55 feet in diameter, when the carriage is going at the rate of 10·4 miles in 1·25 hours? (Take $\frac{22}{7}$ as the ratio of the circumference to the diameter.)

Circumference of wheel = (4·55 × $\frac{22}{7}$) ft.
= (·65 × 22) ft.;
$$\text{Distance travelled per minute} = \frac{10\cdot4\text{ miles}}{1\cdot25\times 60}$$
$$= \frac{10\cdot4\times\frac{352}{5280}}{75}\text{ ft.}$$
$$= \frac{10\cdot4\times 352}{5}\text{ ft.};$$
$$\therefore\ \text{No. of revolutions per minute} = \frac{\overset{16}{10\cdot4}\times\overset{16}{352}}{5\times\underset{1}{.65}\times\underset{1}{22}}$$
$$= \frac{256}{5}$$
= 51·2. Ans.

8. A is 2·6 times as old as B; B is ·9 times as C; C is 20 years old: find A's age.

A's age = 2·6 of ·9 of 20 years
= 2⅗ of 18/20 of 20 years
$$= \left(\frac{8}{3}\times\frac{9}{10}\times\frac{20}{1}\right)\text{ years}$$
= 48 years. Ans.

9. A square pond, whose side is 75 feet, is begirt with a path 2½ yards broad. Find the cost of asphalting this path at 9d. per square yard.

Area of path = (25 + 2½) yds. × 2½ yds × 4
= (27½ × 10) sq. yds.
= 275 sq. yds.;
∴ Cost of asphalting = (275 × 9)d.
= (825 ÷ 4)s.
= 206¼s.
= £10 6s. 3d. Ans.

10. What sum must be added to 9/20 of 1⅑ of 5/27 of £2 to make up 10s.?
$$\text{Sum} = 10\text{s.} - \frac{9}{20}\text{ of }\frac{11}{9}\text{ of }\frac{5}{27}\text{ of }\frac{£2}{3}$$
$$= 10\text{s.} - \frac{11\times\overset{5}{40}}{2\times\underset{1}{20}\times 3}\text{s.}$$
$$= 10\text{s.} - \frac{55}{6}\text{s.}$$
= 10s. − 4s. 7d.
= 5s. 5d. Ans.

11. How do you know at first sight whether a number is or is not divisible by 3, by 4, by 5, by 6, by 8, by 9, and by 10 respectively? Give examples.

A number is divisible:—

By 3, when the sum of its digits is divisible by 3, as 528. 5 + 2 + 8 = 15, and this is divisible by 3.

By 4, when the last two digits are divisible by 4, as 528. 28 is divisible by 4.

By 5, when the last digit is 5 or 0, as 285 and 360.

By 6, when the number is even and the sum of its digits is divisible by 3, as 528.

By 8, when the last three digits are divisible by 8, as 59,528. 528 is divisible by 8.

By 9, when the sum of its digits is divisible by 9, as 4,887. 4 + 8 + 8 + 7 = 27, and this is divisible by 9.

By 10, when the last digit is 0.

12. On New Year's Day the population of a town was 18,500. The death rate was 20 per 1,000, and the birth rate 26 per 1,000: 120 people moved into the town, and 46 left it during the year. Find the percentage of increase at the year's end.

Increase in population—

$$= 18{\cdot}5 \times (26 - 20) + 120 - 46$$
$$= 18{\cdot}5 \times 6 + 74$$
$$= 111 + 74$$
$$= 185;$$

$\therefore$ Percentage of increase $= 185 \times \frac{100}{18500} = \underline{1}$. Ans.

13. Explain, as to a class of scholars, the reason for inverting the divisor, in division of fractions.

Simplify—

$$\frac{3 - \frac{4}{11}}{4 + \frac{2}{1 - \frac{2}{11}}} + \frac{208}{1515}.$$

Suppose we have to divide 5 by $\frac{2}{3}$.

No. of thirds in 5 = 15,

$15 \div 2 = \frac{15}{2}$ or $7\frac{1}{2}$.

Thus, $5 \div \frac{2}{3} = \frac{5 \times 3}{2} = \frac{15}{2} = 7\frac{1}{2}$.

Again, suppose we have to divide $\frac{4}{7}$ by $\frac{2}{3}$.

$\frac{4}{7} \div 2 = \frac{4}{14}$; but this result is 3 times too small, as we have to divide by the third part of 2.

$\therefore$ Quotient $= \frac{5 \times 3}{14} = \frac{15}{14}$ or $1\frac{1}{14}$.

Thus, $\frac{4}{7} \div \frac{2}{3} = \frac{4}{7} \times \frac{3}{2} = \frac{12}{14} = 1\frac{1}{14}$.

Whence the rule:—To divide by a fraction, invert the divisor and multiply.

$$\frac{3 - \frac{4}{11}}{4 + \frac{2}{1 - \frac{2}{11}}} + \frac{208}{1515}$$

$$= \frac{2\frac{7}{11}}{4 + \frac{2}{\frac{9}{11}}} + \frac{8}{15}$$

$$= \frac{2\frac{7}{11}}{4 + \frac{22}{9}} + \frac{8}{15}$$
$$= \frac{29}{58} + \frac{8}{15}$$
$$= \frac{29 + 6}{70}$$
$$= \frac{35}{70}$$
$$= \underline{\frac{1}{2}}. \text{ Ans.}$$

14. What sum of money put out to simple interest at 4 per cent. will amount in $3\frac{3}{4}$ years to £1,616 2s. 8d.?

Amount of £100 for the time $= £100 + £(3\frac{3}{4} \times 4)$
$= £115$;

£ £ s. d. £

$\therefore$ 115 : 1,616 2 8 :: 100 : Principal.

23 20 20

)32,322 13 4(1,405£

23

93

92

122

115

7

20

153(6s.

138

15

12

184(8d.

184

$\therefore$ Sum = £1,405 6s. 8d. Ans.

(To be continued.)

Locke's Thoughts Concerning Education.

BY JOSEPH H. COWHAM, F.G.S.,

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INTRODUCTORY.

I.—SKETCH OF THE LIFE OF LOCKE.

THE philosopher Locke was born at Pensford, near Bristol, in the year 1632. His father was a lawyer who took the part of the Parliamentarians in the civil strife during the reign of Charles I. His son John entered Westminster School at the age of fourteen, and remained until 1651. At the age of twenty he entered Christ College, Oxford, where he obtained his Bachelor's degree in 1655. After taking his Master's degree, he went as Secretary of Legation to Berlin, but returned the following year (1665) to Oxford, and entered upon the further pursuit of knowledge, which, with virtue, he considered the highest goal to which a man could attain. His studies partook of the nature of investigations in Natural Science, a branch of learning which at this time underwent a remarkable development, mainly due to the researches of Boyle and the genius of Newton. Locke began to prepare himself by his scientific pursuits for the medical profession, but a chance meeting between the young philosopher and the first Earl of Shaftesbury, resulted in Locke becoming a member of the nobleman's family as medical adviser, tutor, and friend. He shared, from time to time, in the political fortunes and misfortunes of his patron; at one time he is a State Secretary under his chief as Lord Chancellor; at another time an exile on the Continent, fearful of the displeasure of his sovereign, though never a sharer in political crime. It was during these periods of withdrawal from public work and care that his powerful mind found opportunity for gaining that knowledge and exercising that thought, which combined to yield, in his later days, the writings upon philosophy and education which have raised his name to universal and lasting renown.

Whilst with the Earl of Shaftesbury as his private secretary, Locke undertook the direction of the education of the earl's son and grandson. It was chiefly, however, with the latter that he had the opportunity of putting into actual practice the plans which are found in the 'Thoughts on Education.' These were first communicated in a series of letters to Mr. Clarke, a friend living near Taunton, who had sent a request to Locke, then an exile in Holland, that he would furnish advice upon the training and education of his son. A few years later, in 1693, at the urgent request of a Mr. William Molyneux, Locke was persuaded to collect the letters and publish them. This was done without the letters undergoing a thorough revision, and, as a consequence, there is a lack of style and completeness in the work as a whole, and very frequent and wearisome repetition of some of its parts.

With the accession of William and Mary, Locke felt at liberty to make England again his home. In 1690 he published his great philosophical work, 'The Conduct of the Understanding.' Although pressed by his sovereign to become ambassador to one or other of the continental courts, Locke's health was such that he did not feel justified in accepting the honours and responsibilities of office. He chose rather to spend

the remainder of his life in literary pursuits and in the seclusion of a country life. He retired to the abode of Sir Francis and Lady Masham at Oates, near Chipping Ongar, in Essex, where he found opportunity for another trial of his educational plans. Frank Masham, a child of four, was the subject of the experiment which was attended, in his case, with the most satisfactory results. After fifteen years of life, made happy by the society and generosity of his friends at Oates, and the growing popularity of his literary work, Locke died October, 1704, in the seventy-third year of his age.

In matters relating to education Locke was not a mere theorist. He gained his knowledge largely in the region of actual experience and work. His own formal education at Westminster and at Oxford extended over a period of nearly twenty years, but the book-learning at the former, and the lecturing, the disputations and the declamations at the latter, did not furnish the philosopher with the plans of education which he afterwards formulated. The memory of his own school and college days presented to his mind the form of exercise which, in practice, as tutor and adviser, he sought, for the most part, to avoid. Locke, however, formed an excellent habit, whilst at Oxford, for his own assistance in testing and confirming the knowledge he acquired. He says: 'I have often had experience that a man cannot well judge of his own notions till, either by setting them down on paper, or in discoursing them to a friend, he has drawn them out and, as it were, spread them fairly before himself.'

The power which Locke possessed of analysing knowledge into its mental elements, and the relations these bore to each other in the process of acquisition, induced in him a strong dislike to the classical training and dogmatic instruction of his day. He says:—

> 'I can no more know anything by another man's understanding than I can see by another man's eyes. So much I know, so much truth I have got; so far I am in the right, as I do really know myself; whatever other men have, it is in their possession—it belongs not to me, nor can be communicated to me but by making me alike knowing; it is a treasure that cannot be lent or made over.'

This determination to accept for knowledge only that which his judgment approved and his reason confirmed, led Locke to caution his student against mistaking the existence of words and phrases in the memory for real knowledge. He says:—

> 'Words are of no value nor use but as they are the signs of things; when they stand for nothing they are less than cyphers, for instead of augmenting the value of those they are joined with, they lessen it, and make it nothing; and where they have not a clear, distinct signification, they are like unusual or ill-made figures, that confound our meaning.'—(Locke's Essay 'Of Study.')
>
> 'Knowing is seeing, and if it be so it is madness to persuade ourselves we do so by another man's eyes, let him use ever so many words to tell us that what he asserts is very visible. Till we ourselves see it with our own eyes, and perceive it by our own understandings, we are as much in the dark and as void of knowledge as before, let us believe any learned author as much as we will.' (Locke on the Understanding.)

With the following quotation from the essay 'Of Study,' we must be content in our review of a few of of the fundamental ideas which guided Locke in his plans for early education.

> 'I will only say this one thing concerning books, that however it has got its name, yet converse with books is not, in my opinion, the principal part of study: there are two others that ought to be joined with it, each whereof contributes their share to our improvement in knowledge; and those are meditation and discourse. Reading, methinks, is but collecting the rough material, amongst which a great deal must be laid aside as useless. Meditation is, as it were, choosing and fitting the materials . . . and raising the building; and discourse with a friend (for wrangling in a dispute is of little use) is, as it were, surveying the structure, walking in the rooms, and observing the symmetry and agreement of its parts, taking notice of the solidity or defects of the works, and the best way to find out and correct what is amiss; besides that, it helps often to discover truths, and fix them in our minds as either of the other two.'

Leaving Locke's adverse criticism of the system of education pursued in the schools and colleges of his day, and turning to the plan of instruction which he would substitute for it, we find the following general conditions of learning prominently set forth:—

1. The scheme of instruction is limited almost entirely to the plan Locke would advise for the education of an English gentleman. Hence a private tutor is essential, who 'is to fashion the carriage and form the mind; to settle in his pupil good habits and the principles of virtue and wisdom; to give him vigour, activity and industry; to teach him application, and accustom him to take pains, and to give him some little taste of what his own industry must perfect.' The 'Public School' is not considered a suitable place for the training of a gentleman. 'What qualities,' says Locke, 'are ordinarily to be got from such a troop of playfellows, as schools usually assemble together from parents of all kinds, that a father should so much covet, is hard to divine.

2. The course of study which Locke proposes is not arranged in view of the value of each subject as a means of mental discipline, so much as for the practical value each acquisition possesses for the purposes of life and good society.

(*a*) Reading is to follow speech. 'When he can talk it is time he should begin to learn to read. . . . Great care is to be taken that it be never made as a business to him, nor the look on it as a task.'

(*b*) Writing is to be taught when English can be read well, and 'when he (the pupil) can write well and quick it may be convenient to improve the use of it further in drawing.'

(*c*) 'Latin,' says Locke, 'I look upon as absolutely necessary to a gentleman, and, indeed, custom which prevails over everything has made it so much a part of education that even those children are whipped to it, and made spend many hours of their precious time uneasily in Latin, who, after they are gone from school are never to have more to do with it as long as they live.'

(*d*) 'Because French is a living language, and to be used more in speaking, that should be first learned, that the yet pliant organs of speech may be accustomed to a due formation of those sounds, and beget the habit of pronouncing French well.'

(*e*) English as a subject of study is held in high esteem by Locke. He says, 'Since it is English that an English gentleman will have constant use of, that is the language he should chiefly cultivate and wherein most care should be taken to polish and perfect his style.'

(*f*) Geography is recommended for early school days whilst the memory is most active. The study is to begin with positions in and around the home, followed by learning the positions and names of countries on a map, and completed by a study of the globe, the celestial sphere, and the planetary system.

(*g*) History is highly valued for the instruction it yields, and the delight which the study affords. Locke recommends a course of general chronology followed by Latin history, before the pupil begins the history of his own country.

(*h*) Correct speech is held to be acquired not by the observance of rules so much as by gaining sound and full knowledge, and by reading the best authors. Locke says, 'I have seldom or never observed any one to get the skill of reasoning well, or speaking handsomely by studying those rules which pretend to teach it.' 'Make children,' he says, 'as soon as they are capable of it, often tell a story of any kind they know; and correct at first the most remarkable fault they are guilty of in their way of putting it together.'

(*i*) Respecting Science, Locke 'would not deter any one from the study of nature, because all the knowledge we have, or possibly can have of it, cannot be brought into a Science.'

(*j*) 'Arithmetic is the easiest, and consequently the first sort of abstract reasoning which the mind commonly bears, and is of so general use in all parts of life and business that scarce anything is to be done without it.'

3. Learning is subordinate to the formation of habits and character. 'As years increase,' says Locke, 'liberty must come with them; and in a great many things he must be trusted to his own conduct, since there cannot always be a guard upon him, except what you have put into his own mind by good principle and established habits, which is the best and surest, and therefore *most to be taken care of*.'

4. Every subject of study is to be carefully graduated. 'In this, as in all other parts of instruction, great care must be taken with children to begin with that which is plain and simple, and to teach them as little as can be at once, and settle that well in their heads before you proceed to the next.'

5. The love of knowledge is to be inculcated. 'His tutor should remember that his business is not so much to teach him all that is knowable, as to raise in him a love and esteem of knowledge.'

6. In conclusion, it should be remembered that Locke was a physician, and, as such, in charge of a youth of weak frame, he enjoins a number of physical exercises for the hardening and strengthening of the body. These, together with the chapters upon discipline, and the formation of habits and character, do not enter into the course prescribed for this year's study. The chapters 140 to 190 (inclusive) of the work '*Some Thoughts concerning Education*' will be taken in successive numbers of this journal, with explanation necessary for the complete preparation of the subject.

(To be continued.)

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Publications Received.

BELL & SONS.—Cambridge Texts with Notes:—Virgil's Æneid, Books III. to XII.; The Schoolmaster's Calendar, 1889; Lexicon of Conversational French (*A. Holloway*); Notes on Shakspere's Macbeth (*T. Duff Barnett*)

BEMROSE & SONS.—The Jubilee Drawing Copy Book, Nos. 1 to 17.

BLACKIE & SON.—The Sovereign Reader Home Lesson Book; Realistic Elementary Geography (*Baker*); Sonntag's French Grammar, Part IV. and Complete; Inorganic Chemistry (*Humboldt Sexton*).

CURWEN & SONS.—The Musical Herald, January; Music:—Nursery Toy March (*Clanwill & Deane*); School Cantata—Les francs Chasseurs (*T. Mee Pattison*).

DEACON, G. W., & CO.—Physiography (*E. Hull, M.A.*).

FISHER UNWIN, T.—The Century Magazine, February.

HEYWOOD, JOHN.—Outline of English Literature (*J. C. Wright.*)

HOULSTON & SONS.—The 'Beautiful Valley' Series of Sermons to Children, Nos. 9 and 10 (*Rev. T. Bruster*).

LONGMANS & CO.—Longmans' Junior School Grammar (*D. Salmon*); Longmans' School Arithmetic (*Marshall & Welsford*).

MACMILLAN & CO.—Easy Arithmetical Examples for Beginners (*Bradshaw*).

NELSON, T., & SONS.—The Royal Arithmetic Test Books, Standards 3, 4, 5, 6, and 7.

RELFE BROS.—The Theory of Perspective (*F. Harris*).

SKERRY & CO.—Practical Papers in Higher Arithmetic (*Skerry*).

WHITTAKER & CO.—French Grammar (*Barrère*); Whittaker's Modern French Authors:—Victor Hugo's Bug Jargal (*Boïelle*); Daudet's La Belle Nivernaise (*Boïelle*).

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Publications Reviewed.

The Century Readers Home Lesson Books. Nos. I., II. and III. London: Blackie and Son.

In these Home Lesson Books will be found such portions of the Century Readers as need to be learnt—the spelling lessons, the dictation exercises, the poems for recitation, the verbal explanations, and the course of instruction in Grammar. By the use of such hand books children may be saved the expense of buying the reading-books, and the latter, being kept for use in class, may be spared much wear and tear.

The Century Readers: No. IV. London: Blackie and Son.

This is a recent addition to the series lately commended in these columns for the freshness of the matter, the careful graduation of the lessons, and the general attractiveness of appearance. The present volume is marked by similar merits in equal degree. Some of the lessons are inserted by permission of the Editors of 'The Boys' Own Paper' and 'The Girls' Own Paper'; and the romantic story of Robin Hood occupies twelve chapters. A good selection of short poems is given, those near the end of the book being specially suitable for recitation. There are many exercises in spelling, dictation, and grammar. The books are well-printed, well-illustrated, and neatly bound.

Notes on Shakespeare's Play of Macbeth. By T. Duff Barnett, B.A. London: George Bell and Sons.

The tragedy of Macbeth is likely in the course of this year to become very familiar to many persons. Not only is it appointed by the Education Department for preparation by students in training colleges, and by other examining authorities for other students, but it is specially brought before the general public in its revival on a grand scale by the most celebrated of living actors. The little book before us does not contain the text of the play, but forms an admirable companion to any edition, and affords every kind of help the student is likely to need. The introduction contains a striking criticism on the spirit and meaning of the play; and the 'summary of the tragedy scene by scene' constitutes a valuable running commentary on the progress of the action. Professor Skeat, Dr. Abbott, Dr. Morris and other authorities have evidently been largely consulted in the construction of the notes, which deal with the verbal difficulties in a satisfactory manner. A series of eleven appendices treat separately and fully such subjects as the Prosody of the play, the Grammar, Allusions, Anachronisms, Simile and Metaphor, and others, concluding with more than forty examination questions.

Elsa and the Imprisoned Fairy. A Cantata for Juvenile Voices. By J. G. Bettany and T. Murby. London: Thomas Murby.

If we mistake not, this is, musically, the most pretentious and at the same time the most successful work of the kind that Mr. Murby has yet produced.

It may be performed simply as a musical work by young people in ordinary evening dress, or with the effects of action, costume, and scenery. If the latter method be preferred, full directions are given at the beginning of the book.

The music throughout is 'singable'; and good straightforward melodies, always effective, and often exceedingly bright and tuneful, sustain the interest from the outset to the close.

The printing and general 'get up' are all that could be desired, and the book is remarkably free from the typographical errors which so often disfigure a new work and frustrate the composer's intention.

The only slip of the kind which we notice occurs on page 27, 2nd score, 3rd bar, where there are some rather objectionable consecutive 5ths between the bass and the melody.

Royal Arithmetic Test Book. Standards III.—VII. London and Edinburgh: T. Nelson and Sons.

These are little penny books each containing forty-eight examination tests, of four sums each in Arithmetic. The examples are practical and fairly within the capacity of the average scholar.

(a). Royal Object Lesson Sheets.
(b). Royal Object Lesson Reader.
(c). Royal Notes of Lessons.
London and Edinburgh: T. Nelson and Sons.

This eminent publishing firm is continually bringing out something new for use in our elementary schools. One of its latest efforts is in furnishing the above series for use in Infant Schools. The Object Lesson Sheets (a) are forty in number, bound in cloth, of large size, and faced on both sides. The lessons on the sheets are eighty in number, are printed in bold type which can be seen without effort by a very large class. They are very well chosen and contain a large stock of words of one syllable, and easy dissyllables. Each card contains two chromo lithographed pictures the subjects of which form the bases of the lessons.

Along with the sheets a reader (b), page for page with the sheets, and with similar pictures in black and white is published, while for the use of teachers a shilling book containing the Reader and notes for 250 object lessons completes the series. The teacher will be hard to please who cannot find among these sufficiently varied material to satisfy the most fastidious inspector. Certainly children who for one, two, or three years in a school where they are used cannot leave without intelligence developed and knowledge of common things increased. We should advise infant teachers on the look out for something new to see these publications.

Matriculation Directory, No. 4. Cambridge: The University Correspondence College Office.

This volume of the Tutorial Series has now grown into a book of 132 pages. It is a guide to the reading suitable for those who wish to pass the Matriculation Examination of the London University. It contains a good deal of useful information. Books for the various subjects are recommended, and the parts selected which are essential for the purpose in hand. The special subjects for January and June, 1889, are inserted, and all the papers set in June, 1888. In the shilling edition before us the answers to these questions are given in full. A cheaper edition is published without them. Students who are depending mainly upon their own efforts would find this little book of service to them. The book list is a good one. It is sure not to please everybody. We could not ourselves recommend a few of those chosen. More than one of them, unless we are mistaken, are really not in the market. Additions and corrections will no doubt be made in each edition.

Lessons in Elementary Mechanics. W. H. Grieve, P.S.A. London: Longmans & Co.

This is a series of lessons in that part of mechanics which is prescribed in the new code for the first stage. The book contains fifteen chapters and about 150 pages. It is clearly printed, well illustrated, and strongly and handsomely bound. It is a book which may be recommended. It is much above the average, and, though not perfect, is a sign that there is a serious effort being made to raise the style of the ordinary manuals for boys on other than literary subjects. When statements are made for a boy's information, statements which he reads over and over again, and perhaps learns by heart, we think it is more important that he should read an accurate statement which he cannot quite understand, than that he should read a statement which he can understand but which is not true. We are always sorry, therefore, to see inaccuracies even, we had almost said especially, in children's books. Hence we object to sentences like these: 'Solids always occupy the same space, and retain the same shape.' 'Liquids occupy the same amount of space.' 'Gases have no shape of their own, nor are they confined to one particular size.' One would imagine, from reading about the lactometer on page 86, that by using it 'we may infer the amount of water which has been added to the milk.' The milkmen know better. The experiment on page 94 is not well described. Any one repeating it for the first time would be not a little surprised. The tube is quite full, and we are then told to place the flask in a mixture of pounded ice, and allow to cool; down to 4 C., the author says, we observe the water to sink. As a matter of fact, when the flask is first put into the ice-cold water, there will be a sudden rise of the fluid in the tube if it is not full, and an overflow if it is. This is so marked, and so strange to those who do not understand it, that it ought to have been explained. If the water in the flask were cold at first, and then plunged into hot water, there would be a sudden temporary fall in the tube. Both cases need explanation. We have already said the book is well illustrated. Where these have been borrowed from other works there is a good reason why they retain both the merits and the faults of the originals. But where they are new, one does not see

why they should not have been copies of things which the children could be expected to handle at home, and which any teacher, even in a poor neighbourhood, could obtain for himself. We will give one example. On page 111 there is a can, with seive bottom. The children would be pleased to see the experiment; but their delight would have been increased ten-fold if they had been taught to take a coffee or cocoa canister, prick one hole in the top, and as many as they like at the bottom; immerse the bottom in water, and press it down till full; then place their finger upon the hole and lift it out, and do with it all that could be done with the apparatus drawn in the book. If science is to be of any use we must study things as well as books. There is danger in too much expensive apparatus, and too elaborately appointed laboratories. Let us simplify the essentials as far as possible.

The Educational Annual. By E. Johnson. London: George Philip & Son.

The introduction says that this book is designed to place within reach of the general public a concise summary of authentic information relative to primary and secondary education at a moderate cost. Nearly 300 pages are occupied in giving it, about 150 being devoted to the former, and 100 to the latter. The report of the Royal Commission is summarised in about 36 pages, no difficulty being experienced in deciding the bias of the compiler. In fact, the book is marred in more places than one by the expression of the opinion or the assumptions of the writer. For example, on page 56 he says: 'Sir Francis Sandford's reservation is by far the most important, and *very likely has the approval of the majority of the Commissioners.* Surely, if they approved, they would have signed the reservation. The compiler seems to believe in the principle of payment by results, and patronisingly gives advice to the members of the National Union of Elementary Teachers. He admits that there may be many omissions in his book, and of this we have found plenty of evidence. His knowledge of geography seems limited, for he places Newcastle-on-Tyne in the county of Durham. Among the theological colleges he inserts one at Sunderland which has been closed some time, and omits one at Manchester which is the only one belonging to a great Methodist body. There are many items of statistical information omitted which are necessary to its being, what it aims to be, an 'Educationist's, Schoolmaster's, and Teacher's Handbook.' As, however, it is the first year of publication, we must accord the compiler some praise for having collected a large mass of information, limited though some of it may be, in regard to the primary and secondary education of the country.

Elementary Statics. By Rev. J. B. Lock, M.A. London: Macmillan & Co.

This is a companion volume to that on Dynamics, to which we called attention on a former occasion. It is especially intended for those who are studying for the matriculation of the London University, and examinations of a similar nature, though it is at the same time an introduction to the study of Physics and Practical Mechanics. The whole treatment of the subject is based upon Newton's laws of motion, the accustomed proofs of the fundamental propositions, based upon the principle of the transmissibility of force, being given in a separate chapter. The word resolute, as the abbreviation for resolved past, is introduced. We need hardly say that the subject is treated with that lucidity and skill which are conspicuous in all Mr. Lock's books. The student who masters it, and works the examples, need not fear any fair test of his knowledge. He will have made a good start with a difficult subject, and will find, as he advances, that he has nothing to unlearn. This is high praise, but it is deserved. When excellence has been attained in the exposition of the fundamental propositions of Mechanics, it will be of importance that there should not be too much innovation. Students suffer when every professor treats the subject as if no one had gone before him, or had to come after him.

Practice and Help in the Analysis of Sentences. By C. P. Mason, B.A. London: Bell & Sons.

Like everything Mr. Mason has written for schools, this book has been well done. In the preface he says it is the outcome of the experience and study of a good many years! We can well believe him, for only the experience gained by the examination of thousands of papers could have made him acquainted with all the difficulties he assists in solving, and the various exercises he includes in this book. Teachers may prefer other names for various parts of articles to those which are used in this volume, but there are few helps which they need which cannot be found in it.

Bridge's Class Drawing Sheets, Standard IV. *(a)* Drawing to Scale, *(b)* Model Drawing. London: A. G. Dawson.

We are greatly pleased with these sheets. Mr. Bridge evidently knows what is wanted, and how to supply the want. The Scale Drawing Sheets are varied in character, and admirable in every respect. The Model Drawing Sheets are based upon the principles of perspective, which are employed in teaching the drawing of the slab, square, cube, cone, and cylinder. Each figure is drawn in two colours, so no difficulty is experienced in knowing which part of the figure to construct first. The sheets can be very highly commended.

Commercial Précis-Writing. By the Rev. John Hunter, M.A. London: Longmans, Green and Co.

The useful art of digesting and condensing correspondence for business purposes is taught and illustrated in this book by a systematic and graduated course of instruction and examples. After the introductory observations which explain the nature and object of précis-writing, and show what marks should characterise good abstracts, chapters follow in which the pupil is led on through the successive steps of abridging phrases, reducing complex sentences, omitting less important details, and removing redundant and ornamental expressions to the exercise of summarising a series of letters. Numerous examples for practice are given in each chapter. The work is likely to prove useful to candidates for the commercial examinations recently established by the Oxford and Cambridge Schools Examination Board.

Handbooks to the Code Examinations. Standards I. and II. Manchester: J. Heywood.

The Author of "How to pass 90 per cent. and earn Excellent," has collected a large number of examination questions given by inspectors in various parts of the country in grammar, spelling, geography and mental arithmetic, and published them in two little books for use a few weeks before the annual inspection. They will be a great help in varying the style of question into which most teachers are apt to fall, and will form suitable tests for ascertaining the intelligence of the classes for which they are designed.

The Royal Upper Class Readers. Simple History of English Literature, with Illustrative Extracts. By A. L. Stronach. London: T. Nelson and Sons.

The greater part of this volume consists of a well-written narrative of the history of our literature, including, as it should, sketches of the lives of the writers who made it worthy of our study. The work is written in an easy and fluent style, suited to attract and interest young readers. The chapters on Goldsmith, and Dr. Johnson and his friends, are as entertaining as a novel; and those on 'Poets of Nature'—Thomson, Ramsay, Burns and Cowper,—and on William Wordsworth, and Wordsworth's friends, are calculated to encourage a healthy love of nature and appreciation of the poetic spirit. We note here and there a peculiarity of expression which strikes

us as a Scotticism; for instance, within two pages of the chapter on 'the Elizabethan Drama,' we notice 'the lad would likely be taken to see them play,'—'he likely thought the open fields and gardens of Stratford a better nursery,'—and 'likely whatever he could get.' The later chapters appear to be free from such idioms. The illustrative extracts include many favourite passages, and nearly all are worthy of being committed to memory. Portraits of the most famous writers embellish the volume.

Teachers' Syllabus Book of Work. London: A. G. Dawson.

This little book is issued to save the time of the head teacher. Most teachers are in the habit of apportioning the work of the year for their junior assistants, and examining at stated periods. The Syllabus book is arranged so that the work to be done is written on one page of an opening of the book and the result of the examination opposite. A record is thus kept from month to month of the progress being made in the class. Practical teachers will at once see the advantage to be gained by adopting the system.

Euclid: Books I.—IV. Arranged by A. E. Layng, M. A. London: Blackie and Son.

Each of the first four books is published separately, and the whole in one volume. Simpson's text is followed, no fundamental changes being made. The features of the book are—clean figures with construction lines fainter than other parts of the figures; text, figures, notes and exercises on the propositions all on the same opening of the book; additional problems worked out; a very large number of easy exercises as well as more difficult ones selected from various examination papers; the free use of abbreviations and signs allowed by the various examining bodies; and the displacement of some of Euclid's proofs by well known shorter ones.

The Edition is well-printed, strongly bound, and very serviceable for school purposes.

Longman's Junior School Grammar. By D. Salmon. London: Longman, Green and Co.

We noticed Mr. Salmon's School Grammar in this magazine a short time ago. The Junior School Grammar is the earlier part of that book with such omissions and additions as for the purpose intended were thought suitable. An easier and better introduction to the study of grammar it would be difficult to conceive.

Syllabic Spelling: A Series of Easy Word Lessons. Compiled by Charles Barton. Part I.—For Infant Classes. Part II.—For Standard I. London: George Bell and Sons.

These little books may prove useful to teachers who prefer to teach spelling from a special book rather than from the usual reading books. The words are arranged in sets of twenty and twenty-four, each set illustrating a particular sound or combination of letters. It does not appear that graduation has been sufficiently kept in view, for in the first lesson of Part I. we find the words *wrap* and *chapel*, and in the same Part are included words like *scythe*, *oyster*, *quarry*, *feign*, and many others equally difficult.

Teachers' Drawing Manual for Kindergarten and Infant Schools. By W. Bridge. London: A. G. Dawson, Ivy Lane.

For sixpence any teacher of an Infant School or class can get twenty capital graduated drawing copies, with full notes of lessons. Mr. Bridge is a competent guide to the manufacture of numberless simple designs, which may be formed by little children on squared slates or paper. No more pleasant occupation could be found for infants, and every teacher who gets the book will thank us for drawing attention to it.

Practical Plane and Solid Geometry. By John Carroll. London: Burns and Oates, 63, Paternoster Row.

In its new form, this tenth edition of Mr. Carroll's work, containing a complete course of Elementary Geometry for both Science and Art Students, with its new Lessons on Areas, Orthographic Projection and Graphic Arithmetic, bids fair to gain a still more extended popularity—a success which it richly deserves. The book is cheap, the type clear, the figures bold and well engraved, and the directions leave nothing to be desired.

Milton's Comus. Edited with Introduction and Notes by A. M. Williams, M.A. London: Longmans, Green and Co.

The introduction to this edition of 'Comus' deals with masques in general, the history of the poem, the grammar, the words, the figures of speech and the rhythm. All these subjects are amply and clearly treated, especially the last. In the Notes, which are brief and pointed, sufficient information is given on every difficulty and peculiarity. The book is carefully printed, and is thoroughly adapted for the use of students preparing the poem for examination.

Chambers's Expressive Readers. Books I. and II. London and Edinburgh: W. & R. Chambers.

Good bold type, strong binding, neat covers, thoroughly readable lessons carefully graduated, illustrations adapted to the text, suitable poetry, lists of words, tables, and writing lessons, are the characteristic features of these new readers. What more can teachers want?

Lessons on Light. By Miss Adams. London: Relf Brothers.

This is a small book of 42 pages on light. The author thinks it is possible 'to give a correct, though elementary, idea of the theory of light to children of an early age, and to illustrate the lessons by objects easily obtainable.' Whether such a thing is possible we will not attempt to decide, but it is certain the book before us does not accomplish it. Easy, entertaining, and instructive experiments can be devised, which will amuse children, and serve as a ground-work of facts to be drawn upon afterwards. But to state a number of conclusions without evidence or illustration, and to fancy the ability to repeat these statements is teaching the principles of science, is a great mistake. Such so-called teaching is worse than none. The short chapter on mirrors does not contain a single illustration. We print a third of it as a specimen of the book. 'A mirror is a highly polished surface, showing, by reflection, the objects presented to it. Mirrors are plane or curved. Mirrors are made of metal in some form. The glass mirrors with which we are familiar reflect by reason of the metal behind the glass. Glass alone could not reflect, because, as we have before seen, nearly all the rays are transmitted through a transparent body, leaving none to be reflected.' We think that the children who have to learn science according to this method had better wait; they can spend the time more profitably.

Daisy Dell. A Fairy Operetta. By I. Despicht and Edmund Rogers. London: Curwen and Sons.

This is a short and effective work suitable for school entertainments. The argument is as follows:—Oberon and Titania, seated on a flowery throne, summon their subjects to repel an invasion of fairyland by the spirits of Mischief. When the fairies of Fun arrive they bring in, bound with magic cords, a spy of Prince Hecate's named Mother Grumpy. As punishment, Oberon commands the fairies to attend to her wounds, comfort her with words of hope, and finally to induce her to laugh.

All perform their tasks, and Tipitiwidgit succeeds with her so well that the witch laughs outright. As soon as she does this she is (according to a spell) changed to the good fairy Ariel, Hecate's threats are safely defied, and all ends well with a fairy roundelay.

The music, in addition to being pleasing and tuneful, is light and graceful, and moreover *fairly easy*. We can highly recommend the operetta to teachers in search of a novelty.

The Call to Song. By John Evans and A. L. Cowley. London: Curwen and Sons.

This inexpensive and valuable work embraces the 'Educational Music Charts,' of the Tonic Sol-Fa Method, (compiled for school use by the same co-workers), and additional exercises in voice-training, expression and pronunciation. It also includes the requirements of the Tonic Sol-Fa 'Junior' and 'Elementary' Certificates, and the 'rhythms' or time-tests required for the latter.

When we add that Mr. Evans is the Superintendent of Singing to the School Board for London, and Mr. Cowley the Music Superintendent to the Bradford School Board, it will be evident that the 'Call to Song' is the result of sound and practical knowledge and experience of the highest kind, and a copy of the book should be in the library of every School-Music Teacher. We cannot too highly recommend it.

The Universal parsing Book. By R. Deakin, M. A. London: Relfe Brothers.

This is an ordinary close ruled exercise book, ruled for parsing in such a way as to be suitable for exercises in any language. It is well adapted for the purpose.

The Voices of Nature. An Operetta for Young Voices. By N. B. Sargent. London: Curwen and Sons.

Flowers, bees, birds and frogs, are the voices of Nature, represented, and the characters may be taken by boys and girls, or, if desired, by girls alone.

The introductory march is not very striking, but the music improves considerably as we get further into the work—the music for the frogs being particularly good and appropriate.

There are no difficulties of any kind to be met with in the operetta, which may be regarded as a good specimen of the kind of music required for 'young voices.'

Evangeline. A Cantata for Equal Voices. Adapted and Compiled by J. Graham. London: Curwen and Sons.

Much good and familiar music is comprised in this little work. The Compiler has selected both words and music with commendable care and judgment, and the cantata cannot fail to prove popular. It may be performed under exceptionally easy circumstances, and is admirably suited for school use. We should have preferred some of the pieces in a lower key, especially 'The Anchor's Weighed,' the present settings being rather too high for ordinary voices.

Too Bad, or Discontented Judith. A Children's Operetta. Adapted and Compiled by A. J. Foxwell. London: Curwen and Sons.

Mr. Foxwell's name is sufficient to commend this little work to the attention of our readers. We need only say that the music and words are suitable for school use, that the operetta contains no special difficulties and that the melodies are generally bright and attractive.

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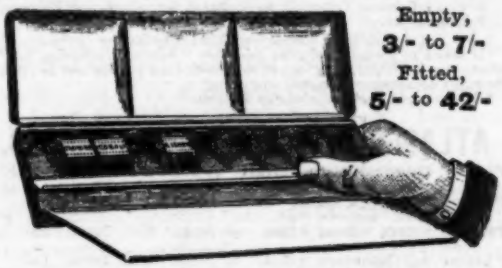

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